



**OHM Remediation  
Services Corp.**

A Subsidiary of OHM Corporation

US EPA RECORDS CENTER REGION 5



471610

***SITE-SPECIFIC  
HEALTH & SAFETY PLAN  
FOR  
REMEDIAL ACTIVITIES AND  
LANDFILL COVER SYSTEM INSTALLATION  
ALBION-SHERIDAN TOWNSHIP LANDFILL  
CALHOUN COUNTY, MICHIGAN***

Submitted to:

The Albion-Sheridan Landfill Group  
and  
Woodward-Clyde International Americas  
Livonia, Michigan

Submitted by:

OHM Remediation Services Corp.  
Trenton, New Jersey

Prepared by:

Paul A. Lawless, CIH  
Regional Industrial Hygienist

Reviewed by:

James F. Kujawa  
Project Manager

Kevin J. McMahon, M.S., CIH  
Regional Health and Safety Director

December 3, 1997  
OHM Project 20374HS

# TABLE OF CONTENTS

---

1.0	INTRODUCTION .....	1-1
1.1	SITE HISTORY .....	1-1
1.2	SCOPE OF WORK .....	1-2
	FIGURE 1.1 SITE MAP .....	1-4
2.0	KEY PERSONNEL .....	2-1
2.1	PROJECT MANAGER .....	2-1
2.2	SITE SUPERVISOR .....	2-1
2.3	SITE SAFETY OFFICER .....	2-1
2.4	HEALTH AND SAFETY MANAGER .....	2-2
2.5	PROJECT CERTIFIED INDUSTRIAL HYGIENIST .....	2-2
2.6	EMPLOYEE SAFETY RESPONSIBILITY .....	2-2
2.7	KEY SAFETY PERSONNEL .....	2-3
	FIGURE 2.1 HEALTH AND SAFETY ORGANIZATION .....	2-4
3.0	JOB HAZARD ANALYSIS .....	3-1
3.1	CHEMICAL HAZARDS .....	3-1
3.2	PHYSICAL HAZARDS .....	3-3
3.3	ENVIRONMENTAL HAZARDS .....	3-3
	FIGURE 3.1 POISONOUS PLANTS .....	3-6
3.4	VEHICLE SAFETY MANAGEMENT .....	3-8
3.5	TASK-SPECIFIC JOB SAFETY ANALYSIS .....	3-9
4.0	WORK AND SUPPORT AREAS .....	4-1
4.1	EXCLUSION ZONE .....	4-1
4.2	CONTAMINATION REDUCTION ZONE .....	4-1
4.3	SUPPORT ZONE .....	4-1
4.4	SITE CONTROL LOG .....	4-1
4.5	GENERAL .....	4-2
5.0	PROTECTIVE EQUIPMENT .....	5-1
5.1	ANTICIPATED PROTECTION LEVELS .....	5-1
5.2	PROTECTION LEVEL DESCRIPTIONS .....	5-2
5.3	SUPPLIED-AIR RESPIRATORS .....	5-3
5.4	BREATHING-AIR QUALITY .....	5-3
5.5	AIR-PURIFYING RESPIRATORS .....	5-3
5.6	RESPIRATOR CARTRIDGES .....	5-3
5.7	CARTRIDGE CHANGES .....	5-4
5.8	INSPECTION AND CLEANING .....	5-4
5.9	FIT TESTING .....	5-4
5.10	FACIAL HAIR .....	5-4
5.11	CORRECTIVE LENSES .....	5-4

# TABLE OF CONTENTS

## (CONTINUATION)

5.12	CONTACT LENSES .....	5-4
5.13	MEDICAL CERTIFICATION .....	5-4
5.14	SITE SPECIFIC PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM .....	5-5
6.0	DECONTAMINATION PROCEDURES .....	6-1
6.1	PERSONNEL DECONTAMINATION .....	6-1
6.2	EQUIPMENT DECONTAMINATION .....	6-3
6.3	DISPOSAL .....	6-3
7.0	AIR MONITORING .....	7-1
7.1	WORK AREA AIR MONITORING .....	7-1
7.2	PERIMETER AIR MONITORING .....	7-2
7.3	INSTRUMENTATION .....	7-2
7.4	AIR MONITORING RECORDKEEPING .....	7-6
7.5	CALIBRATION REQUIREMENTS .....	7-7
7.6	AIR MONITORING RESULTS .....	7-7
8.0	EMERGENCY RESPONSE .....	8-1
8.1	PRE-EMERGENCY PLANNING .....	8-1
8.2	EMERGENCY RECOGNITION AND PREVENTION .....	8-2
	TABLE 8.1 EMERGENCY TELEPHONE NUMBERS .....	8-3
8.3	PERSONNEL, ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS .....	8-3
8.4	SAFE DISTANCES AND PLACES OF REFUGE .....	8-5
8.5	EVACUATION ROUTES AND PROCEDURES .....	8-6
8.6	EMERGENCY SPILL AND RESPONSE PROCEDURES AND EQUIPMENT .....	8-8
8.7	EMERGENCY CONTINGENCY PLANS .....	8-11
8.8	MEDICAL EMERGENCY PROCEDURES .....	8-11
8.9	FIRE CONTINGENCY MEASURES .....	8-12
8.10	HAZARDOUS WEATHER CONTINGENCY MEASURES .....	8-13
8.11	SPILL/RELEASE CONTINGENCY MEASURES .....	8-14
9.0	TRAINING REQUIREMENTS .....	9-1
9.1	SITE ORIENTATION .....	9-1
10.0	MEDICAL SURVEILLANCE PROGRAM .....	10-1
	TABLE 10.1 WORKER MEDICAL PROFILES .....	10-1
10.1	EXAMINATION SCHEDULE .....	10-1

### APPENDICES

APPENDIX A	HEALTH AND SAFETY PLAN CERTIFICATION
APPENDIX B	OHM HAZARD COMMUNICATION PROGRAM
APPENDIX C	MATERIALS SAFETY DATA SHEET
APPENDIX D	SITE-SPECIFIC PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM

# 1.0 INTRODUCTION

---

This Health and Safety Plan (HASP) has been developed for the Albion-Sheridan Township Landfill Site (ASTL).

This HASP documents the policies and procedures which protect workers and the public from potential hazards posed by work at this site and is a key component in the *OHM Safety Improvement Process*. OHM considers safety the highest priority during work at a site containing potentially hazardous materials and has established a goal of **zero incidents** for all projects. All projects will be conducted in a manner which minimizes the probability of injury, accident, or incident occurrence. This HASP is a key element in the proper planning of project work which is necessary to assure the goal of **zero incidents** is achieved. The HASP Certification (Appendix A) will be signed by all who actively participate at this project.

Although this plan focuses on the specific work activities planned for this site, it must remain flexible because of the nature of this work. Conditions may change and unforeseen situations may arise that require deviations from the original plan. This flexibility allows modification by the OHM supervisors and health and safety officials with approval from the project Certified Industrial Hygienist (CIH).

## 1.1 SITE HISTORY

The ASTL is an inactive landfill located at 29975 East Erie Road approximately one mile east of Albion, Michigan on the eastern edge of Calhoun County (Figure 1.1). The site occupies approximately 18 acres. The site is surrounded by residential, agricultural, commercial and industrial properties. One residence is located immediately adjacent to the landfill to the south and five additional residences are located approximately 1,000 to 1,500 feet (ft) southwest of the landfill along East Erie Road. An active railroad track borders East Erie Road to the south of the landfill, and beyond the railroad tracks lies the North Branch of the Kalamazoo River. South of the river is agricultural land. The site does not fall within the flood plain of the river. There are wetlands south of the site adjacent to the river, separated from the site by the railroad tracks and Erie Road, which are not expected to be impacted by site activities.

The Amberton Village housing development is located adjacent to the site on the east side, with the closest residences approximately 500 ft from the landfill. Several residences and commercial businesses are located along the Michigan Avenue approximately 500 ft north of the site. Immediately west of the site is undeveloped land formerly used for agriculture. The Orchard Knoll subdivision is located approximately 1,500 ft northwest of the landfill. Approximately 2,000 ft northwest of the site is a landfill associated with Brooks Foundry. Approximately one mile west of the ASTL site is the City of Albion.

The ASTL Site was used as a sand and gravel borrow pit and for open, unpermitted dumping for an unspecified period of time prior to 1966. From 1966 to 1981, the landfill was privately owned and operated by Mr. Gordon Stevick. The landfill accepted municipal landfill refuse and industrial wastes from households and industrial wastes from households and industries in the City of Albion and nearby townships. In the early 1970s, the Michigan Department of Natural Resources (MDNR) approved the landfill to accept an estimated 6,000 cubic yards of metal plating sludges. Other materials, such as paint wastes and thinners, oil and grease, and dust, sand, and dirt containing fly ash and casting sand were also disposed of at the site. The landfill ceased operation in 1981.



The landfill is currently covered with a 1 to 4 ft thick layer of silty sand with some gravel. The cover thickness averages approximately two ft. Refuse is present within the cover material at some locations, and includes sludge, glass fragments and insulation. Refuse material is scattered at the ground surface throughout the landfill, particularly in the slopes; this material includes metal, plastic, concrete, asphalt, 55 gallon drums, wood, tires, a storage tank, and a junk crane.

The landfill ranges from 16 to 35 ft thick. During drilling of leachate head wells, refuse interlayered with medium to fine sand was encountered. Landfill gases, including total VOCs at concentrations greater than 10,000 ppm, were encountered during the installation of wells and subsidence monuments of the landfill. Subsurface soil/waste samples contained up to 1,500 ppm total VOCs.

Waste samples from borings contained numerous constituents, including 10 VOCs, 19 semi-volatile organic compounds (SVOCs), and 11 pesticides/PCBs. Several inorganic substances were present above background levels in subsurface soils, including antimony, arsenic, chromium, copper, lead, mercury and zinc. The highest concentrations in soil include lead at 208 mg/kg, arsenic at 13.1 mg/kg and chromium at 13.5 mg/kg.

Landfill constituents in groundwater extend southwest of the landfill for approximately 900 ft and extends vertically to a depth of approximately 45 ft below the water table. The unconsolidated aquifer contains 1,2-dibromo-3-chloropropane and antimony at concentrations above their respective federal Maximum Contaminant Level (MCL). The bedrock aquifer plume contains vinyl chloride at the MCL and arsenic above the MCL, at concentrations up to 126 ug/l.

### 1.2 SCOPE OF WORK

The principal tasks to be conducted are listed below.

#### 1997 Construction Season Tasks:

- Mobilization, Site Setup
- Temporary Erosion Control Installation
- Clearing, Grubbing, Tree Felling
- Construct Drum Staging Area
- Drum Excavation and Removal/Overpacking
- Drum Sampling
- Debris Removal
- Winter Shutdown/Demobilization

#### 1998 Construction Season Tasks:

- Remobilization
- Access Road Construction
- Borrow Area Development
- Tank Excavation/ Remove and Scrap
- Waste Excavation/Relocation
- Rough Grading
- Gas Vent System Installation
- Well Abandonment
- Landfill Cap Installation

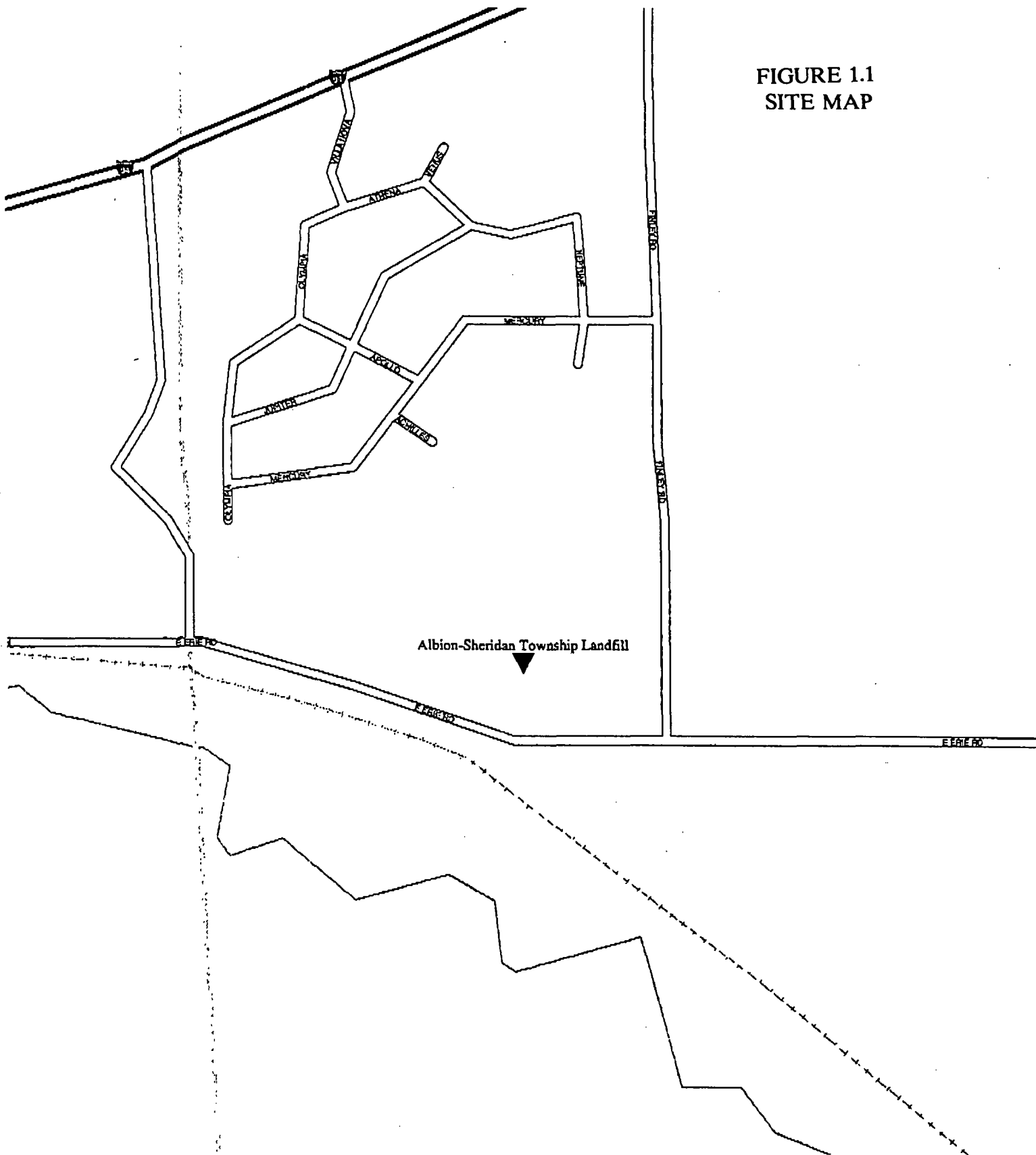


- New Well Installation
- Stormwater Controls Installation
- New Fence Installation
- Equipment Decontamination

These activities have been analyzed for potential hazards for which control measures are provided in Section 3.4, Job Safety Analysis.

This HASP has been prepared for the above scope of work. Any changes to the scope of work will require amendment of the plan to remain approved.

**FIGURE 1.1**  
**SITE MAP**



## **2.0 KEY PERSONNEL**

---

The Project Manager (PM), Site Supervisor (SS), Certified Industrial Hygienist (CIH), Health and Safety Manager (HSM), and Site Safety Officer (SSO) are responsible for formulating and enforcing health and safety requirements, and implementing the HASP. Reporting relationships are shown in Figure 2.1

### **2.1 PROJECT MANAGER**

The PM has the overall responsibility for the project and to assure that the requirements of the contract are attained in a manner consistent with the HASP requirements. The PM will coordinate with the SS and the SSO to assure that the work is completed in a manner consistent with the HASP. The PM will conduct a periodic health and safety audit of the project using the **Management Safety Improvement Report** form as required in the Standard Operating Procedure. The PM reports to the Director of Operations. Specific Key Requirement Areas (KRA's) for safety performance include:

- Implementing a Site Specific Safety Awareness/ Recognition program
- Conduct periodic site audit (Management Safety Improvement Report); one report within 30 days of mobilization; followup reports every 90 days until job completion
- Implementing a Safety Improvement Team
- Investigating and reporting findings for any OSHA recordable incidents; assuring corrective actions are taken

### **2.2 SITE SUPERVISOR**

The SS is responsible for field implementation of the HASP. The SS will be the main contact in any on-site emergency situation. The SS will act as the SSO if one is not assigned. The SS will conduct periodic inspections (at least weekly) of the work site to confirm compliance with all health and safety requirements. The Project Safety Improvement Checklist shall be used to document inspections. The SS is also responsible for coordinating remedial actions for all deficiencies and for enforcing the OHM "Cardinal Safety Rules." The SS reports to the Project Manager. Specific Key Requirement Areas (KRA's) for safety performance include:

- Completing Site Specific Job Safety Analyses for all principle tasks
- Implementing Site Specific Safety Awareness/ Recognition program
- Conduct weekly safety inspections of job sites
- Implementing Safety Improvement Team
- Correcting all deficiencies as noted on Management Safety Improvement Reports and safety department audits, within recommended time frames
- Investigating and reporting findings for any OSHA recordable cases; assuring corrective actions are taken

### **2.3 SITE SAFETY OFFICER**

The SSO has responsibility for administering the HASP relative to site activities, and will be in the field while site activities are in progress. The SSO's primary operational responsibilities include personal and environmental monitoring, coordination of job safety analyses, selection and care of personal protective equipment, assignment of protection levels and review of work permits. The SSO will monitor all field activities involved with safety and is authorized to stop work when an imminent health or safety risk exists. The

SSO is responsible for informing all on-site personnel of essential safety requirements and facilitating the daily safety meetings. The SSO reports jointly to the Health and Safety Manager (HSM) and the Project Manager. Specific Key Requirement Areas (KRA's) for SSO performance include:

- Monitoring workers for signs of stress, such as cold exposure, heat stress, and fatigue
- Reevaluating site conditions on an on-going basis. Coordinate protective measures including engineering controls, work practices and personal protective equipment
- Assisting the SS in the preparation, presentation and documentation of daily safety meetings
- Conducting and prepare reports of daily safety inspections of work processes, site conditions, equipment conditions and submit to SS. Discuss any necessary corrective actions with the SS and review new procedures
- Initiating revisions of the HASP as necessary for new tasks or modifications of existing operations and submit to the Project CIH for approval
- Performing air monitoring as required
- Assisting the PM and SS in accident investigations
- Preparing permits for special operations, e.g., hot work, confined spaces, line breaking, etc.
- Maintaining site safety records
- Conducting weekly inspections of all fire extinguishers, supplied air respirators, first-aid kits, and eye washes/emergency showers
- Ensuring that project management/ purchasing has pre-qualified sub contractors during the bidding stage. Inform subcontractors of the elements of the HASP/contractor pre-job checklist
- Coordinating the preparation of Job Safety Analyses with the SS, team leader, and work crew
- Coordinating the daily Safety Observer Program
- Coordinating the Site Specific Safety and Health Awareness and Recognition Program (SHARP) with Project Manager and Supervisor
- Coordinating the Site Safety Improvement Team on an as necessary basis

### 2.4 HEALTH AND SAFETY MANAGER

The HSM is responsible for staffing health and safety personnel and monitoring projects for compliance with regulatory and OHM health and safety policies and procedures. This position reports to the Regional Health and Safety Director and will audit the site periodically to ensure compliance with this HASP.

### 2.5 PROJECT CERTIFIED INDUSTRIAL HYGIENIST

The Project CIH is responsible for reviewing the HASP and ensuring that the HASP is complete and accurate. The Project CIH provides technical and administrative support for the Site Health and Safety Program. If necessary, the CIH can modify specific aspects of the HASP to adjust for on-site changes that affect safety. The CIH will coordinate with the HSM and SSO on necessary modifications to the HASP and will be available for consultation when required. The CIH may make periodic site visits to determine compliance. The CIH reports to the Regional Vice President/General Manager.

### 2.6 EMPLOYEE SAFETY RESPONSIBILITY

Each employee is responsible for personal safety as well as the safety of others in the area and is expected to participate fully in the *Safety Improvement Process*, particularly the Safety Observation Program. The employee will use all equipment provided in a safe and responsible manner as directed by the SS. All OHM personnel will follow the policies set forth in the OHM Health and Safety Procedures Manual, with particular emphasis on the OHM "Cardinal Safety Rules." Site personnel concerned with any aspect of health

and safety shall bring it to the attention of the SS/SSO. If not satisfied, they should contact the Regional Health and Safety Director. All project personnel have the authority to stop work if in their judgement serious injury could result from continued activity. The SS and the SSO shall be notified immediately if this becomes necessary. To protect the health and safety of all personnel, employees that knowingly disregard safety policies/procedures may be subject to disciplinary actions.

**2.7 KEY SAFETY PERSONNEL**

The following individuals share responsibility for health and safety at the site.

Project Manager	James F. Kujawa 419-425-6322 (office)
Site Supervisor	Bill Poma _____ (site phone)
Site Safety Officer	TBD _____ (site phone)
Health and Safety Manager/ Project CIH	Michael A. Zustra, M.S.P.H., CIH 508-497-6125 (office) 800-731-9629 (pager)
Northern Region Health and Safety Director	Kevin McMahon, M.S., CIH 609-588-6375 (office) 800-901-1429 (pager)
Vice President, Health and Safety	Fred Halvorsen, Ph.D., PE, CIH 800-231-7031

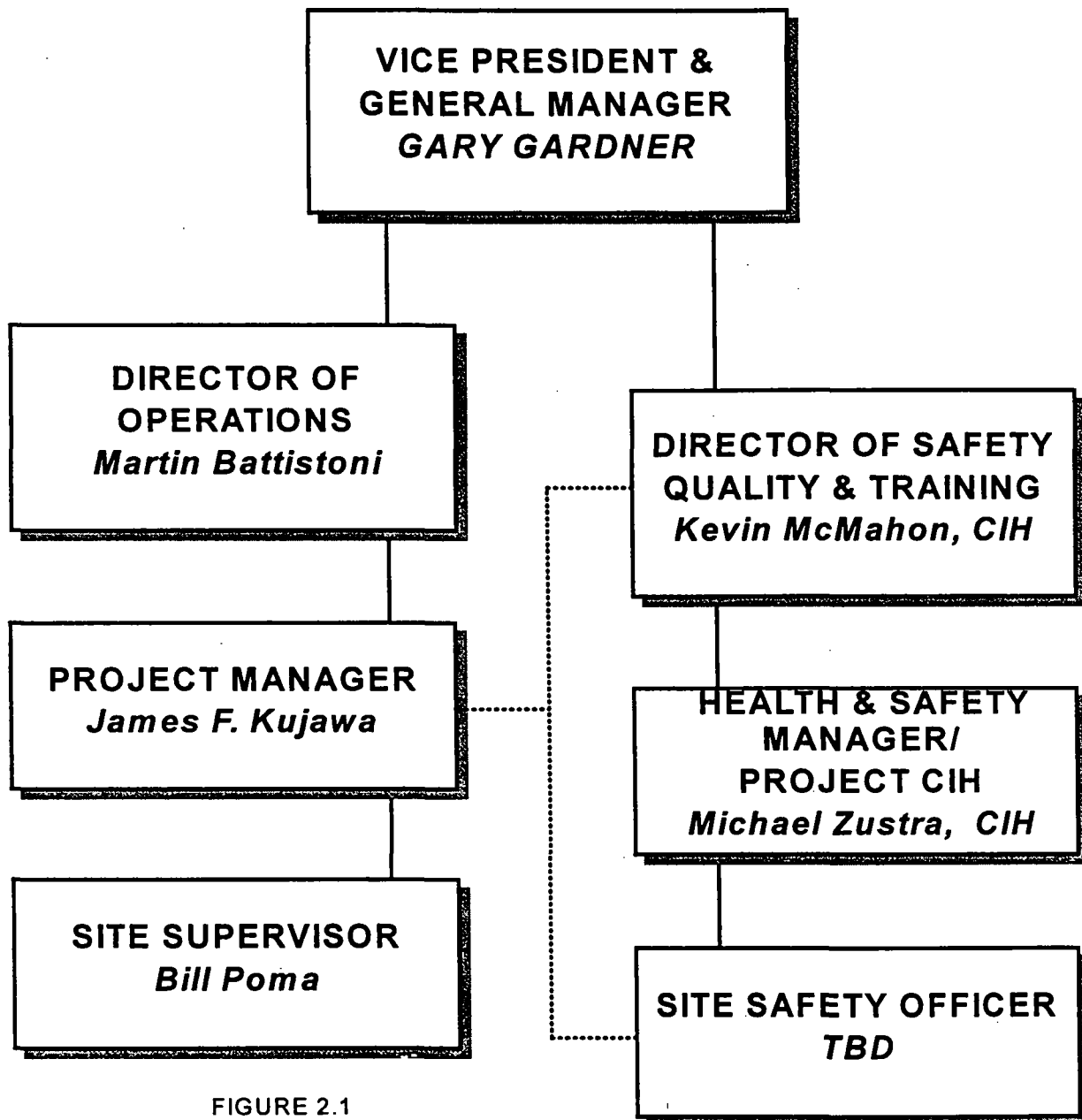


FIGURE 2.1

TBD = To Be Decided

HEALTH & SAFETY ORGANIZATION  
Remediation Activities and Landfill Cover System  
Installation  
Albion-Sheridan Township Landfill  
Calhoun County, Michigan  
OHM Project 20374

Prepared for

ALBION-SHERIDAN LANDFILL GROUP AND  
WOODWARD-CLYDE INTERNATIONAL  
AMERICAS  
LAVONIA, MICHIGAN

## 3.0 JOB SAFETY ANALYSIS

This section outlines the potential chemical and physical hazards which workers may be exposed to during work on this project. Section 3.1 reviews hazards associated with chemicals/contaminants identified at the site. An MSDS list is included in Appendix C.

### 3.1 CHEMICAL HAZARDS

The primary routes of exposure for arsenic, chromium, cyanide salts, fly ash, lead, pesticides and PCBs are inhalation and skin contact with particulates. The primary routes of exposure for toluene and vinyl chloride (VOCs), waste oils and benzo(a)pyrene (SVOCs) are inhalation and skin contact with impregnated soil particles and vapors. Exposure to these compounds may occur during drum and waste excavation/consolidation and sampling activities, tank excavation and monitoring well abandonment/installation. A review of previously conducted sampling activities indicates that these contaminants are generally present in relatively low concentrations. Minimum initial protection levels, given in Section 5.0 of the HASP, will be utilized until sufficient air monitoring data is collected which may support a downgrading of initial PPE levels.

CHEMICAL	EXPOSURE ROUTES	PEL/TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
Arsenic	Skin, Eye, Inhalation, Ingestion	0.005 mg/m <sup>3</sup>	A human carcinogen; a powerful allergen, inhalation and contact causes burning, swelling and redness in the eyes, nose, throat and skin; ingestion causes nausea, vomiting, nervous system effects in the extremities (numbness, tingling, weakness); long term exposure can cause liver, kidney, and blood damage
			A fire hazard in the form of dust or contact with oxidizers; thermal decomposition produces toxic gases
Benzo(a) pyrene (SVOC)	Skin, eye, inhalation, ingestion	0.2 mg/m <sup>3</sup>	An Animal Carcinogen, probable human carcinogen; a nasal, respiratory tract, and skin irritant
			Reacts with acids and oxidizers; produces acrid smoke, toxic gases when involved in fires, thermal decomposition
Chromium	Skin, eye, inhalation, ingestion	0.5 mg/m <sup>3</sup> Cr (VI) 0.001 mg/m <sup>3</sup>	Some Chromium (VI) compounds are confirmed human carcinogens; corrosive irritant to skin, eyes, respiratory tract; deep skin ulcers; not (always) immediately painful; an allergic sensitizer; 5 grams ingested can be fatal
			Reacts with strong oxidizers, alkalis, can react with, ignite oils, grease, paper and plastics





## JOB SAFETY ANALYSIS

CHEMICAL	EXPOSURE ROUTES	PEL/TLV	HEALTH HAZARDS/ PHYSICAL HAZARDS
Cyanide salts	Skin, eye, inhalation, ingestion	5 mg/m <sup>3</sup> Ceiling	A chemical asphyxiant; headache, weakness, confusion, unconsciousness, convulsions, coma, and death; cyanide salts, liquids are corrosive to all body tissues; characteristic almond odor
			Reacts violently with, acids, nitrates and peroxides; releases highly flammable and toxic HCF gas
DDT Dichloro diphenyl trichloroethylene (pesticides)	Skin, Eye, Inhalation, Ingestion	0.5 mg/m <sup>3</sup>	A skin, eye irritant; numbness, tingling lips, face, tongue; headache, fatigue, nausea, vomiting, tremors, convulsions; a suspect carcinogen
			reacts with strong acids and oxidizers, thermal decomposition can release toxic fumes of Cl-
Fly Ash	Skin, eye, inhalation	10 mg/m <sup>3</sup>	An eye and respiratory irritant; coughing, sneezing, dryness of the mouth; watering of the eyes
			Reacts with strong oxidizers
Lead	Inhalation, ingestion	0.05 mg/m <sup>3</sup>	Weakness, insomnia; loss of appetite, loss of weight, abdominal pain; anemia; tremors; weakness of wrists/ankles; kidney damage; low blood pressure
			Incompatible with strong oxidizers, hydrogen peroxide and acids
Polychlorinated Biphenyls	Skin, eye, inhalation, ingestion	0.5 mg/m <sup>3</sup>	Irritation of eyes, skin; acne-form dermatitis; potential carcinogen; liver damage
			Reacts with strong oxidizers
Toluene (paint solvent)	Skin, eye, inhalation, ingestion	50 ppm SKIN	Fatigue, weakness, confusion, euphoria, dizziness, headache, dilated pupils, insomnia, numbness/tingling in hands, feet, dermatitis
			Reacts with strong oxidizers; flammable liquid; releases toxic gases during combustion
Vinyl Chloride	Skin, eye, inhalation, ingestion	1 ppm	A carcinogen; headache, vertigo, narcosis, collapse; affects CNS; skin and eye irritation
			A severe fire and explosion hazard; reacts with copper, aluminum, and hydroquinone; forms toxic decomposition products when involved with fires or heat; HCl, carbon monoxide, and phosgene
Waste Oil	Skin, eye, inhalation, ingestion	5mg/m <sup>3</sup> (mineral oil mist)	Irritating to skin, eyes, respiratory tract; headache, dizziness, nausea, vomiting and loss of coordination; an acne like rash, pimples around hair follicles
			Incompatible with strong oxidizing agents; thermal decomposition releases, toxic gases

Personnel will be removed from the work site and placed under observation immediately if the following symptoms occur:

- Dizziness or stupor
- Nausea, headaches, or cramps
- Irritation of the eyes, nose, or throat
- Euphoria
- Chest pains and coughing
- Rashes or burns

### **3.2 PHYSICAL HAZARDS**

To minimize physical hazards, OHM has developed standard safety protocols which will be followed at all times. Failure to follow safety protocols will result in expulsion of an employee from the site and appropriate disciplinary actions.

The SS and SSO will observe the general work practices of each crew member and equipment operator, and enforce safe procedures. Work areas will be inspected by the crew leaders, SS and SSO. All hazards will be corrected in a timely manner. Job Safety Analyses will be developed for each principal activity and will identify all major hazards to which employees may be exposed. Hard hats, safety glasses, and steel-toe safety boots are required in all areas of the site. Site-specific hazards and all necessary precautions will be discussed at the daily safety meetings. The Health and Safety Procedures Manual will be maintained at the project site as a reference document.

### **3.3 ENVIRONMENTAL HAZARDS**

Environmental factors such as weather, wild animals, insects, and irritant plants pose a hazard when performing outdoor work. The SSO and SS will take all necessary measures to alleviate these hazards should they arise.

#### **3.3.1 Heat Stress**

The combination of warm ambient temperature and protective clothing result in the potential for heat stress. Heat stress disorders include:

- Heat rash
- Heat cramps
- Heat exhaustion
- Heat stroke

Heat stress prevention is outlined in procedure 3-4 of the OHM Corp. Health and Safety Procedures manual. This information will be reviewed during safety meetings. Workers will be encouraged to increase consumption of water and electrolyte-containing beverages (e.g., Gatorade).

It is recommended that workers break at least every two hours for 10 to 15 minute rest periods when temperatures rise above 72.5 degrees F and protective clothing is worn. In addition, workers are encouraged to take rests whenever they feel any adverse effects that may be heat-related. The frequency of breaks may need to be increased upon worker recommendation to the SSO and SS. Heat stress can be prevented by assuring an adequate work/rest schedule; guidelines are printed below.



AMBIENT TEMPERATURE	NO CHEMICAL PROTECTIVE CLOTHING Level D	PROTECTION LEVELS C/B/A
90° F or above	After 45 minutes of work	After 15 minutes of work
87.5 F-90 F	After 60 minutes of work	After 30 minutes of work
82.5-87.5 F	After 90 minutes of work	After 60 minutes of work
77.5-82.5 F	After 120 minutes of work	After 90 minutes of work
72.5-77.5 F	After 150 minutes of work	After 120 minutes of work

The work/rest schedule can be calculated based on heat stress monitoring results. Monitoring consists of taking the radial pulse of a worker for 30 seconds immediately after exiting the work area.

If the heart rate exceeds 110 beats per minute at the beginning of the rest period, shorten the next work cycle by 1/3 and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, increase the following rest period by 1/3. The initial rest period should be at least 10 minutes.

Body temperature measured orally or through the ear canal may also be monitored to assess heat stress. Workers should not be permitted to continue work when their body temperature exceeds 100.4 F (38C). Monitoring should be conducted at the intervals given above.

Monitoring for heat stress will begin when the ambient temperature reaches or exceeds 70 degrees Fahrenheit when wearing Level C PPE, or 80 degrees Fahrenheit for site activities performed in Level D. Monitoring will include pulse rate, weight loss, oral temperature and signs and symptoms of heat stress. See Procedure 3-4, Health and Safety Procedures Manual.

### 3.3.2 Exposure to Cold

With outdoor work in the winter months, the potential exists for hypothermia and frostbite. See Procedure 3-5, Health and Safety Procedures Manual.

Protective clothing greatly reduces the possibility of hypothermia in workers. However, personnel will be instructed to wear warm clothing and to stop work to obtain more clothing if they become too cold. Employees will also be advised to change into dry clothes if their clothing becomes wet from perspiration or from exposure to precipitation.

In cold weather, the potential for frostbite exists, especially in body extremities. Personnel will be instructed to pay particular attention to hands, feet, and any exposed skin when dressing. Personnel will be advised to obtain more clothing if they begin to experience loss of sensation due to cold exposure.

Employees will be encouraged to use the heated shelters on site at regular intervals depending upon the severity of ambient temperatures. Symptoms of cold stress, including heavy shivering, excessive fatigue, drowsiness, irritability, or euphoria necessitate immediate return to the shelter.



### **3.3.3 Biological Hazards**

- **POISON IVY (*Rhus Radicans*)**

Poison Ivy may be found at the site. It is highly recommended that all personnel entering into an area with poison ivy wear a minimum of a tyvek coverall, to avoid skin contact.

The majority of skin reactions following contact with offending plants are allergic in nature and characterized by:

- General symptoms of headache and fever
- Itching
- Redness
- A rash

Some of the most common and most severe allergic reactions result from contact with plants of the poison ivy group, including poison oak and poison sumac. Such plants produce severe rash characterized by redness, blisters, swelling, and intense burning and itching. The victim may develop a high fever and feel very ill. Ordinarily, the rash begins within a few hours after exposure, but may be delayed 24 to 48 hours.

#### **Distinguishing Features of Poison Ivy Group Plants**

The most distinctive features of poison ivy and poison oak are their leaves, which are composed of three leaflets each. Both plants have greenish-white flowers and berries that grow in clusters.

#### **First Aid**

- a. Remove contaminated clothing; wash all exposed areas thoroughly with soap and water, followed by rubbing alcohol. 1% hydrocortisone cream (over-the-counter) will aid in healing and reducing itch.
- b. Apply calamine or other soothing lotion if rash is mild.
- c. Seek medical advice if a severe reaction occurs, or if there is a known history of previous sensitivity.

#### **Contaminated Clothing**




The irritating substances emitted by poison ivy group plants will remain on clothing for prolonged periods of time - up to weeks or months, if not washed thoroughly. It may be necessary to wash contaminated clothing separately and more than once before reusing.

- **TICKS**

Heavily vegetated areas of a site may have ticks. It is highly recommended that all personnel walking through such areas wear a Tyvek coverall and latex boot covers taped at all joints. The ticks will stand out against the light colors. A tick or insect repellent containing DEET is recommended.



**FIGURE 3.1  
POISONOUS PLANTS**

	<p><b>COMMON POISON IVY (RHUS RADICANS)</b></p> <ul style="list-style-type: none"><li>• Grows as a small plant, a vine, and a shrub.</li><li>• Grows everywhere in the United States except California and parts of adjacent states. Eastern oak leaf poison ivy is one of its varieties.</li><li>• Leaves always consist of three glossy leaflets.</li><li>• Also known as three-leaf ivy, poison creeper, climbing sumac, poison oak, markweed, picry, and mercury.</li></ul>
<p><b>WESTERN POISON OAK (RHUS DIVERSILOBA)</b></p> <ul style="list-style-type: none"><li>• Grows in shrub and sometimes vine form.</li><li>• Grows in California and parts of adjacent states.</li><li>• Sometimes called poison ivy, or yera.</li><li>• Leaves always consist of three leaflets.</li></ul>	
	<p><b>POISON SUMAC (RHUS VERNIX)</b></p> <ul style="list-style-type: none"><li>• Grows as a woody shrub or small tree from 5 to 25 feet tall.</li><li>• Grows in most of eastern third of United States.</li><li>• Also known as swamp sumac, poison elder, poison ash, poison dogwood, and thunderwood.</li></ul>



Ticks can transmit several diseases, including Rocky Mountain spotted fever, a disease that occurs in the eastern portion of the United States as well as the western portion, and Lyme disease. Ticks adhere tenaciously to the skin or scalp. There is some evidence that the longer an infected tick remains attached, the greater is the chance that it will transmit disease.

### First Aid

- a. Carefully (slowly and gently) remove the tick with tweezers, taking care that all parts are removed.
- b. With soap and water, thoroughly, but gently, scrub the area from which the tick has been removed, because disease germs may be present on the skin; also wipe the bite area with an antiseptic.
- c. If you have been bitten, place the tick in a jar labeled with the date, location of the bite, and the location acquired. If any symptom appears, such as an expanding red rash, contact a physician immediately.

### • LYME DISEASE

Lyme disease may cause a number of medical conditions, including arthritis, that can be treated if you recognize the symptoms early and see your doctor. Early signs may include a flu-like illness, an expanding skin rash and joint pain. If left untreated, Lyme disease can cause serious nerve and heart problems as well as a disabling type of arthritis.

You are more likely to spot early signs of Lyme disease rather than see the tick or its bite. This is because the tick is so small (about the size of the head of a common pin or a period on this page and a little larger after they fill with blood), you may miss it or signs of a bite. However, it is also easy to miss the early symptoms of Lyme disease.

In its early stage, Lyme disease may be a mild illness with symptoms like the flu. It can include a stiff neck, chills, fever, sore throat, headache, fatigue, and joint pain. But this flu-like illness is usually out of season, commonly happening between May and October when ticks bite.

Most people develop a large, expanding skin rash around the area of the bite. Some people may get more than one rash. The rash may feel hot to the touch and may be painful. Rashes vary in size, shape, and color, but often look like a red ring with a clear center. The outer edges expand in size. It's easy to miss the rash and the connection between the rash and the tick bite. The rash develops from three days to as long as a month after the tick bite. Almost one third of those with Lyme disease never get the rash.

Joint or muscle pain may be another early sign of Lyme disease. These aches and pains may be easy to confuse with the pain that comes from other types of arthritis. However, unlike many other types of arthritis, this pain seems to move or travel from joint to joint.

In later stages, Lyme disease may be confused with other medical problems. These problems can develop months to years after the first tick bite.



Early treatment of Lyme disease symptoms with antibiotics can prevent the more serious medical problems of later stages. If you suspect that you have symptoms of Lyme disease, notify the SS or SSO; or if you have demobilized from the project site, contact your doctor.

Lyme disease can cause problems with the nervous system that look like other diseases. These include symptoms of stiff neck, severe headache, and fatigue usually linked to meningitis. They may also include pain and drooping of the muscles on the face, called Bell's Palsy. Lyme disease can also mimic symptoms of multiple sclerosis or other types of paralysis.

Lyme disease can cause serious but reversible heart problems, such as irregular heart beat. Finally, Lyme disease can result in a disabling, chronic type of arthritis that most often affects the knees. Treatment is more difficult and less successful in later stages. Researchers think these more serious problems may be linked to how the body's defense or immune system responds to the infection.

### 3.3.4 Noise

Hearing protection is required for workers operating or working near heavy equipment, where the noise level is greater than 85 dbA (Time Weighted Average) as well as personnel working around heavy equipment. The SSO will determine the need and appropriate testing procedures, (i.e., sound level meter and/or dosimeter) for noise measurement.

### 3.4 VEHICLE SAFETY MANAGEMENT

Motor vehicle incidents are the number one cause of occupational fatalities, accounting for one in three deaths. OHM employees involved in the operation and use of OHM and/or leased or rented vehicles will comply with the *OHM Vehicle Management Policy* (see Northern Region Safety Manual). OHM requires employees to use seat belts at all times when traveling in OHM owned or leased/rented vehicles. The SS and/or SSO will develop a parking area plan, including backing vehicles into parking spaces, using spotters for backing vehicles and policy mandated vehicle inspections.

OHM employees are expected to incorporate safe actions and preparations to avoid vehicle accidents and personal injury during work and off hours. Breaks should be planned into lengthy job mobilizations and demobilizations, including rotation of drivers at regular intervals. If parking areas are busy or crowded and more than one worker is traveling in the same vehicle, one worker should remain outside the vehicle as it leaves the parking space to assist the driver with traffic observation. Vehicles traveling before dawn and at dusk in rural or wooded areas should be prepared for wildlife, e.g. deer crossing roadways.

OHM employees arriving at work areas should park vehicles away from delivery, heavy equipment and vehicle loading/unloading locations to prevent parked vehicles from damage by various deliveries. Heavy equipment operators should inspect areas and request vehicles to be moved or spotters used if necessary, to maneuver equipment in tight areas. Employees who observe near misses or potential risks to parked or moving vehicles must report these to the SS or SSO immediately.

OHM employees are expected to use the vehicle inspection form and check/test the safety systems on the vehicle on a daily basis. Check the following: brakes, mirrors, seat belts, tires, leakage from the undercarriage, lights and turn signals. Vehicles with safety deficiencies must be reported immediately and not driven until properly repaired. Vehicles running errands from different project sites should have telephone numbers of the job site in the vehicle in case calls for assistance are required.



Because of the different ways alcohol can affect behavior, even in very small amounts, the best and safest course is not to drink before driving. At OHM, a driver with blood alcohol concentration (BAD) over 0.04% is considered to be under the influence and subject to disciplinary action. Personnel involved in motor vehicle incidents are subject to drug and alcohol testing.

Weather conditions can have a profound effect on driving. On slippery roads, drive more slowly. Stop and turn with care. Keep several car lengths from other vehicles. At speeds in excess of 35 mph, the chances of hydroplaning increase with speed. In general, keep back 1 car length for every 10 mph to prevent striking the car ahead.

In the event of a vehicle incident, notify your Site Supervisor *immediately* and complete all required reports.

### **3.5 TASK-SPECIFIC JOB SAFETY ANALYSES**

This section of the Site-Specific HASP provides a breakdown of the hazards and control measures for each principal task. These Job Safety Analyses are general in nature and must be made project specific by the Site Supervisor prior to each task. The Job Safety Analyses will be field checked by the supervisor on an ongoing basis and revised as necessary. All revisions will be communicated to the work crew.



## 3.5.1

## JOB SAFETY ANALYSIS FOR SITE PREPARATION

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; ≥ 5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; ≥ 5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Equipment/ Facility Set-up	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways work areas of equipment, tools, vegetation, excavated material and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Electrical Shock	<ul style="list-style-type: none"> <li>De-energize or shut off utility lines at their source before work begins</li> <li>Use double insulated or properly grounded electric power-operated tools</li> <li>Maintain tools in a safe condition</li> <li>Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters</li> <li>Use qualified electricians to hook up electrical circuits</li> <li>Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation</li> <li>Cover or elevate electric wire or flexible cord passing through work areas to protect from damage</li> <li>Keep all plugs and receptacles out of water</li> <li>Use approved water-proof, weather-proof type if exposure to moisture is likely</li> <li>Inspect all electrical power circuits prior to commencing work</li> <li>Follow Lockout-Tagout procedures in accordance with OHM Health and Safety Procedures # 6-4</li> </ul>	Lockout/Tagout Devices	
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		



**3.5.1**

**JOB SAFETY ANALYSIS FOR SITE PREPARATION**

**AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Equipment/ Facility Set-up (Continued)	Sharp Objects	<ul style="list-style-type: none"><li>• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li><li>• Maintain all hand and power tools in a safe condition</li><li>• Keep guards in place during use</li></ul>	Leather gloves	
	High Noise Levels	<ul style="list-style-type: none"><li>• Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li></ul>	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	<ul style="list-style-type: none"><li>• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li><li>• Provide fluids to prevent worker dehydration</li></ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

## **3.5.2**

## **JOB SAFETY ANALYSIS FOR TEMPORARY EROSION CONTROL INSTALLATION**

### **AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Clothing and Equipment</b>	<b>Monitoring Devices</b>
Silt Fence, Hay Bale Installation	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Allergic Reaction	<ul style="list-style-type: none"> <li>Identify and review poisonous plants with workers</li> <li>Provide workers proper skin protection to prevent skin allergic reaction from exposure to hay, contaminated soil, plants, or other skin irritants</li> </ul>	Tyvek coveralls, duct tape bottom of coveralls to boots; latex gloves within cotton gloves, if required	
	Struck-by Hand Tools, Flying Debris	<ul style="list-style-type: none"> <li>Hold stakes in place with tongs, vice-pliers or other remote grasping tools</li> <li>Wear safety goggles when using sledge hammer, hatchet, maul or axe</li> </ul>	Leather gloves, face shield and goggles	
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li> <li>Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

3.5.3

## JOB SAFETY ANALYSIS FOR CLEARING AND GRUBBING, TREE FELLING

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Clearing, Grubbing	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> <li>Use reflective warning vests worn when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Understand and review hand signals</li> </ul>	Warning vests, Hard hat, safety glasses	
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Eye Injuries	<ul style="list-style-type: none"> <li>Wear face shield, goggles when operating powered clearing / grubbing equipment</li> </ul>	Face shield, goggles	
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> <li>Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation</li> </ul>	Leather gloves	

## 3.5.3

## JOB SAFETY ANALYSIS FOR CLEARING AND GRUBBING, TREE FELLING

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Clearing, Grubbing (Continued)	Insect/ Snake Bites	<ul style="list-style-type: none"> <li>Review injury potential and types of snakes with workers</li> <li>Avoid insect nests areas, likely habitats of snakes outside work areas</li> <li>Emphasize The Buddy System where such injury potential exists</li> <li>Use insect repellant, wear PPE to protect against sting/bite injuries</li> </ul>	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	
	Contact Dermatitis	<ul style="list-style-type: none"> <li>Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants</li> <li>Identify and review poisonous plants with workers</li> </ul>	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers (See Section 5.0 HASP)	
	Operations of power clearing tools ( brush saws, weed wackers...)	<ul style="list-style-type: none"> <li>Wear eye, face, hand &amp; hearing protection when operating power clearing equipment</li> <li>Shut-off / idle power tools walking between work areas</li> <li>Store flammable liquids in well ventilated areas, away from work areas</li> <li>Shut off equipment during re-fueling</li> <li>Prohibit smoking while operating clearing equipment</li> <li>Provide ABC (or equivalent) fire extinguishers for all work</li> </ul>	Face shield, goggles, cloth gloves, ear plugs	
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li> <li>Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment



## 3.5.3

## JOB SAFETY ANALYSIS FOR CLEARING AND GRUBBING, TREE FELLING

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Tree Felling; Chippers, Chainsaws	Fires	<ul style="list-style-type: none"> <li>Eliminate sources of ignition from the work area</li> <li>Prohibit Smoking</li> <li>Provide ABC (or equivalent) fire extinguishers for all flammable storage areas, powered cutting equipment re-fueling areas, fuel powered generators and compressors</li> <li>Store flammable liquids in well ventilated areas</li> <li>Prohibit storage, transfer of flammable liquids in plastic containers</li> <li>Enforce use of approved flammable liquid safety cans</li> <li>Post "NO SMOKING" signs</li> <li>Store combustible materials away from flammables</li> <li>Allow chainsaw to cool off before re-fueling</li> <li>Prohibit chainsaw startup in re-fueling areas</li> </ul>		
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris</li> <li>Mark, identify, or barricade other obstructions</li> <li>Ensure safe footing before starting chainsaws</li> </ul>		
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Prohibit handling, touching chain blade while chainsaw is operating</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	Operation of chippers	<ul style="list-style-type: none"> <li>Lockout/tag-out/de-energize any electrical circuits on chippers before clearing/maintenance</li> <li>Identify staging area for debris</li> <li>Keep chipper approach free of ground debris</li> <li>Follow all precautions for operation of power cleaning tools</li> </ul>		

## 3.5.3

## JOB SAFETY ANALYSIS FOR CLEARING AND GRUBBING, TREE FELLING

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; ≥ 5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; ≥ 5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Tree Felling; Chippers, Chainsaws (Continued)	Kickback	<ul style="list-style-type: none"> <li>• Maintain both hands on chainsaw while cutting</li> <li>• Avoid cutting actions that may pinch the chain blade</li> <li>• Idle or shut down chainsaw when walking any distance</li> <li>• Operate chainsaws only at 'full' power when cutting</li> <li>• Prohibit use of defective chainsaws</li> </ul>		
	Struck By/ Against Heavy Equipment, Falling Objects, Flying Debris	<ul style="list-style-type: none"> <li>• Use reflective warning vests worn when exposed to vehicular traffic</li> <li>• Wear face protection to avoid facial injury from flying chain debris</li> <li>• Isolate equipment operation, tree felling areas (2 ½ tree lengths)</li> <li>• Make eye contact with (chainsaw) operators before approaching</li> <li>• Inspect tree for dead, broken limbs before cutting</li> <li>• Prohibit cutting overhead, above shoulder height</li> <li>• Understand and review hand signals</li> </ul>	Warning vests, Hard hat, safety goggles and face shield	
	Burns	<ul style="list-style-type: none"> <li>• Wear proper PPE for protection from hot motor parts, muffler</li> </ul>	Leather gloves	
	Caught in/between	<ul style="list-style-type: none"> <li>• Prohibit standing on, straddling logs while ground cutting</li> <li>• Stand uphill while ground cutting</li> <li>• Start relieving cuts on compression side of log first, then make bucking cut on tension side</li> <li>• Prohibit workers from holding logs while being cut</li> <li>• Stop saw motor to remove saw if pinched</li> </ul>		

3.5.3

## JOB SAFETY ANALYSIS FOR CLEARING AND GRUBBING, TREE FELLING

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
Tree Felling; Chippers, Chainsaws (Continued)	Insect Bites	<ul style="list-style-type: none"> <li>Review injury potential with workers</li> <li>Avoid insect nests areas, likely habitats outside work areas</li> <li>Emphasize The Buddy System where such injury potential exists</li> <li>Use insect repellent, wear PPE to protect against sting/bite injuries.</li> </ul>	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	
	Contact Dermatitis	<ul style="list-style-type: none"> <li>Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants</li> <li>Identify and review poisonous plants with workers</li> </ul>	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers (See Section 5.0 HASP)	
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li> <li>Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment



3.5.4

**JOB SAFETY ANALYSIS FOR DRUM STAGING AREA CONSTRUCTION**

**AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Drum Staging Area Construction	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools, construction debris and other materials</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Sprains and Strains	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> <li>Control pulling, placement of liner materials</li> <li>Prohibit running during placement of liner materials</li> </ul>		
	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> <li>Use reflective warning vests when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Barricade or enclose the work area</li> <li>Restrict work area entry to authorized personnel only during construction activities</li> <li>Wear hard hats, safety glasses with side shields, and steel-toe safety boots</li> <li>Understand and review hand signals</li> </ul>	Warning vests, Hard hat, Safety glasses	
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	



**3.5.4**

**JOB SAFETY ANALYSIS FOR DRUM STAGING AREA CONSTRUCTION**

**AIR MONITORING: "ACTION LEVELS"**

**PID:** <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

**MINI-RAM:** <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

**LEL/O<sub>2</sub>:** ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Drum Staging Area Construction (Continued)	Handling Heavy Objects	<ul style="list-style-type: none"><li>Observe proper lifting techniques</li><li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li><li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li></ul>		
	High Noise Levels	<ul style="list-style-type: none"><li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li></ul>	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	<ul style="list-style-type: none"><li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li><li>Provide fluids to prevent worker dehydration</li></ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment



## 3.5.5

## JOB SAFETY ANALYSIS FOR DRUM EXCAVATION HANDLING/OVERPACKING

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; ≥ 5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; ≥ 5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Excavation of Drums	Underground/Overhead Utilities	<ul style="list-style-type: none"> <li>Identify all utilities around the site before work commences</li> <li>Cease work immediately if unknown utility markers are uncovered</li> <li>Use manual excavation within 3 feet of known utilities</li> <li>Utility clearance shall conform with 29 CFR 1926.955 (high voltage &gt;700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance</li> </ul>		
	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> <li>Use reflective warning vests when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Understand and review hand signals</li> </ul>	Warning vests, hard hat, safety glasses	
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter



## **3.5.5**

## **JOB SAFETY ANALYSIS FOR DRUM EXCAVATION HANDLING/OVERPACKING**

### **AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Clothing and Equipment</b>	<b>Monitoring Devices</b>
Excavation of Drums (Continued)	Excavation Wall Collapse	<ul style="list-style-type: none"> <li>Construct diversion ditches or dikes to prevent surface water from entering excavation</li> <li>Provide good drainage of area adjacent to excavation</li> <li>Collect ground water/rain water from excavation and dispose of properly</li> <li>Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face</li> <li>Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth</li> <li>Place ladders no more than 25 feet apart laterally</li> <li>Treat excavations over 4 feet deep as confined spaces</li> <li>Complete confined space permit entry procedure</li> <li>Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency</li> <li>Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required</li> <li>Assign a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting</li> <li>Inspect excavations (when personnel entry is required) daily, any time conditions change</li> <li>Provide at least two means of exit for personnel working in excavations</li> </ul>	Hard hat, safety glasses	
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		

## 3.5.5

## JOB SAFETY ANALYSIS FOR DRUM EXCAVATION HANDLING/OVERPACKING

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Excavation of Drums (Continued)	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants with workers before operations begin</li> <li>Dampen soil using light water spray to prevent fugitive dust emissions</li> <li>Cover stockpiled soil with plastic sheeting to prevent fugitive dust emissions</li> </ul>	Saranex-coated Tyvek coveralls, nitrile gloves, neoprene boots (See Section 5.0 HASP)	LEL/O <sub>2</sub> , PID, Mini-RAM
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li> <li>Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
Drum Staging/Overpacking	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		



## 3.5.5

## JOB SAFETY ANALYSIS FOR DRUM EXCAVATION HANDLING/OVERPACKING

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Drum Staging/ Overpacking (Continued)	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> <li>Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar motions</li> <li>Assure guards are in place to protect from these parts of equipment during operation</li> <li>Provide and use proper work gloves when the possibility of pinching, or other injury may be caused by moving/ handling large or heavy objects</li> <li>Maintain all equipment in a safe condition</li> <li>Keep all guards in place during use</li> <li>De-energize and locked-out machinery before maintenance or service</li> </ul>		
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Fire/ Explosion	<ul style="list-style-type: none"> <li>Eliminate sources of ignition from the work area</li> <li>Prohibit smoking in work areas</li> <li>Provide ABC (or equivalent) fire extinguishers for all work, flammable storage areas; fuel powered generators and compressors</li> <li>Store flammable liquids in well ventilated areas</li> <li>Prohibit storage, transfer of flammable liquids in plastic containers</li> <li>Post "NO SMOKING" signs</li> <li>Store combustible materials away from flammables</li> <li>Store, all compressed gas cylinders upright, caps in place when not in use</li> <li>Separate Flammables and Oxidizers by 20 feet minimum</li> </ul>		



**3.5.5**

**JOB SAFETY ANALYSIS FOR DRUM EXCAVATION HANDLING/OVERPACKING**

**AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Drum Staging/ Overpacking (Continued)	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	Struck by, Against Heavy Equipment, Protruding Objects	<ul style="list-style-type: none"> <li>Use reflective warning vests worn when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Understand and review hand signals</li> </ul>	Warning vests, Hard hat, Safety glasses	
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants with workers before operations begin</li> </ul>	Saranex-coated Tyvek coveralls, nitrile gloves, neoprene boots (See Section 5.0 HASP)	LEL/O <sub>2</sub> , PID, Mini-RAM
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures #3-4, 3-5</li> <li>Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

3.5.6

## **JOB SAFETY ANALYSIS FOR CONTAINER SAMPLING**

### **AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Clothing and Equipment</b>	<b>Monitoring Devices</b>
Container Sampling	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Wizard gloves or equivalent	
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants with workers before operations begin</li> </ul>	Sarane-coated Tyvek coveralls, nitrile gloves, neoprene boots (see Section 5.0 HASP)	LEL/O <sub>2</sub> , PID, Mini-RAM
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li> <li>Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment



3.5.7

## **JOB SAFETY ANALYSIS FOR SURFACE DEBRIS REMOVAL**

### **AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Clothing and Equipment</b>	<b>Monitoring Devices</b>
Surface Debris Removal	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools and debris</li> <li>Mark, identify, or barricade other obstructions</li> <li>Place secure safety lines, ladders for stream access, egress on steep banks</li> </ul>		
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Cuts and Lacerations	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	sound level meter
	Insect/ Snake Bites	<ul style="list-style-type: none"> <li>Review injury potential and types of snakes with workers</li> <li>Avoid insect nests areas, likely habitats of snakes outside work areas</li> <li>Emphasize The Buddy System where such injury potential exists</li> <li>Use insect repellent, wear PPE to protect against sting/bite injuries.</li> </ul>	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	
	Contact Dermatitis	<ul style="list-style-type: none"> <li>Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants</li> <li>Identify and review poisonous plants with workers</li> </ul>	Polyethylene-coated Tyvek coveralls, vinyl gloves, latex boot covers (See Section 5.0 HASP)	



3.5.7

## JOB SAFETY ANALYSIS FOR SURFACE DEBRIS REMOVAL

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Surface Debris Removal (Continued)	High/Low Ambient Temperature	<ul style="list-style-type: none"><li>• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li><li>• Provide fluids to prevent worker dehydration</li></ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

3.5.8

## JOB SAFETY ANALYSIS FOR ACCESS ROAD CONSTRUCTION

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Access Road Construction	Struck by/Against Heavy Equipment, Protruding Objects	<ul style="list-style-type: none"> <li>Use reflective warning vests when exposed to vehicular traffic</li> <li>Avoid equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Barricade or enclose the work area</li> <li>Restrict entry to the work area to authorized personnel during paving activities</li> <li>Understand and review hand signals</li> </ul>	Warning vests, Hard hat, goggles, face shield, Steel-toe work boots	
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools, debris, &amp; other materials</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Inhalation and Contact with Dusts and Particulates, Contact Dermatitis	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Apply water spray to road surfaces to minimize/eliminate fugitive dust</li> <li>Wear PPE to avoid skin contact with contaminated soil, or other skin irritants</li> </ul>	Tyvek coveralls, Hard hat, Steel-toe boots, Cotton or equivalent gloves, duct tape bottom of coveralls to boots or latex boot covers (See Section 5.0 HASP)	
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li> <li>Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment



## 3.5.9

## JOB SAFETY ANALYSIS FOR BORROW AREA DEVELOPMENT

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Borrow Area Development	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> <li>Use reflective warning vests worn when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Understand and review hand signals</li> </ul>	Warning vests, Hard hat, safety glasses	
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> <li>Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation</li> </ul>	Leather gloves	
	Insect/ Snake Bites	<ul style="list-style-type: none"> <li>Review injury potential and types of snakes with workers</li> <li>Avoid insect nests areas, likely habitats of snakes outside work areas</li> <li>Emphasize The Buddy System where such injury potential exists</li> <li>Use insect repellent, wear PPE to protect against sting/bite injuries</li> </ul>	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	



3.5.9

**JOB SAFETY ANALYSIS FOR BORROW AREA DEVELOPMENT**

**AIR MONITORING: "ACTION LEVELS"**

**PID:** <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

**MINI-RAM:** <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

**LEL/O<sub>2</sub>:** ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Borrow Area Development (Continued)	Contact Dermatitis	<ul style="list-style-type: none"><li>Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants</li><li>Identify and review poisonous plants with workers</li></ul>	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers (See Section 5.0 HASP)	
	High Noise Levels	<ul style="list-style-type: none"><li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li></ul>	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	<ul style="list-style-type: none"><li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li><li>Provide fluids to prevent worker dehydration</li></ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

**3.5.10**

**JOB SAFETY ANALYSIS FOR TANK EXCAVATION, CLEAN AND SCRAP**

**AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Excavation of Tank	Underground/Overhead Utilities	<ul style="list-style-type: none"> <li>Identify all utilities around the site before work commences</li> <li>Cease work immediately if unknown utility markers are uncovered</li> <li>Use manual excavation within 3 feet of known utilities</li> <li>Utility clearance shall conform with 29 CFR 1926.955 (high voltage &gt;700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance</li> </ul>		
	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> <li>Use reflective warning vests worn when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Understand and review hand signals</li> </ul>	Warning vest, Hard hat, Safety glasses	
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter



3.5.10

## JOB SAFETY ANALYSIS FOR TANK EXCAVATION, CLEAN AND SCRAP

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Excavation of Tank (Continued)	Excavation Wall Collapse	<ul style="list-style-type: none"> <li>Construct diversion ditches or dikes to prevent surface water from entering excavation</li> <li>Provide good drainage of area adjacent to excavation</li> <li>Collect ground water/rain water from excavation and dispose of properly</li> <li>Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face</li> <li>Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth</li> <li>Place ladders no more than 25 feet apart laterally</li> <li>Treat excavations over 4 feet deep as confined spaces</li> <li>Complete confined space permit entry procedure</li> <li>Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency</li> <li>Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required</li> <li>Assign a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting</li> <li>Inspect excavations (when personnel entry is required) daily, whenever conditions change</li> <li>Provide at least two means of exit for personnel working in excavations.</li> </ul>	Hard hat, Safety glasses	
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear, walkways of equipment, vegetation, excavated material, tools and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		

**3.5.10**

## **JOB SAFETY ANALYSIS FOR TANK EXCAVATION, CLEAN AND SCRAP**

### **AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Clothing and Equipment</b>	<b>Monitoring Devices</b>
Excavation of Tank (Continued)	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>• Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>• Review hazardous properties of site contaminants with workers before operations begin</li> </ul>	Saranex-coated Tyvek coveralls, nitrile gloves, neoprene boots (see Section 5.0 HASP)	LEL/O <sub>2</sub> , PID
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li> <li>• Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment
Tank Clean/Scrap	Fire/ Explosion	<ul style="list-style-type: none"> <li>• Eliminate sources of ignition from the work area</li> <li>• Prohibit smoking</li> <li>• Provide ABC (or equivalent) fire extinguishers in all work, flammable storage areas and with fuel powered generators and compressors</li> <li>• Store flammable liquids in well ventilated areas</li> <li>• Prohibit storage, transfer of flammable liquids in plastic containers</li> <li>• Post "NO SMOKING" signs</li> <li>• Store combustible materials away from flammables</li> <li>• Store all compressed gas cylinders upright, caps in place when not in use</li> <li>• Separate Flammables and Oxidizers by 20 feet minimum</li> </ul>		



3.5.10

## JOB SAFETY ANALYSIS FOR TANK EXCAVATION, CLEAN AND SCRAP

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Tank Clean/Scrap (Continued)	Flammable, Toxic, Oxygen deficient Atmospheres	<ul style="list-style-type: none"> <li>Test vessel atmosphere for flammable/toxic vapors, and oxygen deficiency</li> <li>Obtain Confined Space Entry Permit signed by Supervisor/Safety Officer</li> <li>De-energize, lock-out and tag all energized equipment</li> <li>Provide written rescue plan</li> <li>Review hazardous properties of site contaminants with entrants and safety observer</li> <li>Review emergency procedures before work commences</li> <li>Provide safety observer outside vessel</li> <li>Wear proper level of PPE for the type of atmospheric contaminants</li> <li>Use body harness, safety belt with tripod winch for possible rescue</li> </ul>		LEL/O <sub>2</sub>
	Burns	<ul style="list-style-type: none"> <li>Use proper work gloves, face shield/safety goggles, and leather apron to protect workers from skin burns when welding, cutting, and burning</li> </ul>	Face shield, Safety goggles	
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants with workers before operations begin</li> </ul>	Saranex-coated Tyvek coveralls, nitrile gloves, neoprene boots (see Section 5.0 HASP)	LEL/O <sub>2</sub> , PID
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	



**3.5.10**

**JOB SAFETY ANALYSIS FOR TANK EXCAVATION, CLEAN AND SCRAP**

**AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Backfilling	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"><li>• Use reflective warning vests worn when exposed to vehicular traffic</li><li>• Isolate equipment swing areas</li><li>• Make eye contact with operators before approaching equipment</li><li>• Understand and review posted hand signals</li></ul>	Warning vest, Hard hat, Safety Glasses	
	Slips, Trips, Falls	<ul style="list-style-type: none"><li>• Clear, walkways of equipment, vegetation, excavated material, tools and debris</li><li>• Mark, identify, or barricade other obstructions</li></ul>		
	Sharp Objects	<ul style="list-style-type: none"><li>• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li><li>• Maintain all hand and power tools in a safe condition</li><li>• Keep guards in place during use</li></ul>	Leather gloves	
	High/Low Ambient Temperature	<ul style="list-style-type: none"><li>• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li><li>• Provide fluids to prevent worker dehydration</li></ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

## 3.5.11

## JOB SAFETY ANALYSIS FOR WASTE EXCAVATION/CONSOLIDATION/ROUGH GRADING

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM, LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup>, LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Waste Excavation/ Consolidation/ Rough Grading	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> <li>Use reflective warning vests worn when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Understand and review hand signals</li> </ul>	Warning vests, Hard hat, safety glasses	
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants with workers before operations begin</li> </ul>	Tyvek coveralls, latex or neoprene boots, nitrile gloves (see Section 5.0 HASP)	LEL/O <sub>2</sub> , PID, Mini-RAM
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> <li>Close doors, windows on heavy equipment to prevent injuries from tree branches and other vegetation</li> </ul>	Leather gloves	



3.5.11

**JOB SAFETY ANALYSIS FOR WASTE EXCAVATION/CONSOLIDATION/ROUGH GRADING**

**AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Waste Excavation/ Consolidation/ Rough Grading (Continued)	Insect/ Snake Bites	<ul style="list-style-type: none"><li>Review injury potential and types of snakes with workers</li><li>Avoid insect nests areas, likely habitats of snakes outside work areas</li><li>Emphasize The Buddy System where such injury potential exists</li><li>Use insect repellant, wear PPE to protect against sting/bite injuries</li></ul>	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers	
	Contact Dermatitis	<ul style="list-style-type: none"><li>Wear PPE to avoid skin contact with contaminated soil, plants, or other skin irritants</li><li>Identify and review poisonous plants with workers</li></ul>	Tyvek coveralls, duct tape bottom of coveralls to boots or latex boot covers (See Section 5.0 HASP)	
	High Noise Levels	<ul style="list-style-type: none"><li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li></ul>	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	<ul style="list-style-type: none"><li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li><li>Provide fluids to prevent worker dehydration</li></ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

3.5.12

## **JOB SAFETY ANALYSIS FOR GAS VENT SYSTEM INSTALLATION**

### **AIR MONITORING: "ACTION LEVELS"**

**PID:** <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

**MINI-RAM:** <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

**LEL/O<sub>2</sub>:** ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Clothing and Equipment</b>	<b>Monitoring Devices</b>
Trench Excavation	Underground/Overhead Utilities	<ul style="list-style-type: none"> <li>Identify all utilities around the site before work commences</li> <li>Cease work immediately if unknown utility markers are uncovered</li> <li>Use manual excavation within 3 feet of known utilities</li> <li>Utility clearance shall conform with 29 CFR 1926.955 (high voltage &gt;700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance</li> </ul>		
	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> <li>Use reflective warning vests when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Understand and review hand signals</li> </ul>	Warning vests, hard hat, safety glasses	
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter

3.5.12

## JOB SAFETY ANALYSIS FOR GAS VENT SYSTEM INSTALLATION

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Trench Excavation (Continued)	Excavation Wall Collapse	<ul style="list-style-type: none"> <li>Construct diversion ditches or dikes to prevent surface water from entering excavation</li> <li>Provide good drainage of area adjacent to excavation</li> <li>Collect ground water/rain water from excavation and dispose of properly</li> <li>Store excavated material at least 2 feet from the edge of the excavation; prevent excessive loading of the excavation face</li> <li>Provide sufficient stairs, ladders, or ramps when workers enter excavations over 4 feet in depth</li> <li>Place ladders no more than 25 feet apart laterally</li> <li>Treat excavations over 4 feet deep as confined spaces</li> <li>Complete confined space permit entry procedure</li> <li>Monitor atmosphere for flammable/toxic vapors, and oxygen deficiency</li> <li>Slope, bench, shore, or sheet excavations over 5 feet deep if worker entry is required</li> <li>Assign a competent person to inspect, decide soil classification, proper sloping, the correct shoring, or sheeting</li> <li>Inspect excavations (when personnel entry is required) daily, any time conditions change</li> <li>Provide at least two means of exit for personnel working in excavations</li> </ul>	Hard hat, safety glasses	
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		

3.5.12

## JOB SAFETY ANALYSIS FOR GAS VENT SYSTEM INSTALLATION

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Trench Excavation (Continued)	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants with workers before operations begin</li> <li>Dampen soil using light water spray to prevent fugitive dust emissions</li> <li>Cover stockpiled soil with plastic sheeting to prevent fugitive dust emissions</li> </ul>	Tyvek coveralls, nitrile or latex gloves, neoprene or latex boots (See Section 5.0 HASP)	LEL/O <sub>2</sub> , PID
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li> <li>Provide fluids to prevent worker dehydration</li> </ul>		
Gas Vent System Installation	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> <li>Use reflective warning vests when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Barricade or enclose the construction area</li> <li>Restrict entry to the work area to authorized personnel during construction activities</li> <li>Wear hard hats, safety glasses with side shields, and steel-toe safety boots at all times</li> <li>Understand and review hand signals</li> </ul>	Warning vests, hard hat, safety glasses, goggles and face shield	
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools, debris and construction materials</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		



3.5.12

## JOB SAFETY ANALYSIS FOR GAS VENT SYSTEM INSTALLATION

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Gas Vent System Installation (Continued)	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> <li>Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar motions</li> <li>Assure guards are in place to protect from these parts of equipment during operation</li> <li>Provide and use proper work gloves when the possibility of pinching, or other injury may be caused by moving/ handling large or heavy objects</li> <li>Maintain all equipment in a safe condition</li> <li>Keep all guards in place during use</li> <li>De-energize and lock-out machinery before maintenance or service</li> </ul>	Leather gloves	
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants with workers before operations begin</li> </ul>	Tyvek coveralls, nitrile gloves, neoprene boots (See Section 5.0 HASP)	LEL/O <sub>2</sub> , PID



3.5.12

## **JOB SAFETY ANALYSIS FOR GAS VENT SYSTEM INSTALLATION**

### **AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Clothing and Equipment</b>	<b>Monitoring Devices</b>
Backfilling	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, vegetation, excavated material, tools, and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Struck By/ Against Heavy Equipment	<ul style="list-style-type: none"> <li>Use reflective warning vests worn when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Understand and review hand signals</li> </ul>	Warning vests, hard hat safety glasses	
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li> <li>Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

3.5.13

## JOB SAFETY ANALYSIS FOR EXCAVATION, MONITORING WELL ABANDONMENT

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Abandonment of Monitoring Wells	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, debris and excavated materials</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter
	Struck by/ Against Heavy Equipment, Protruding Objects	<ul style="list-style-type: none"> <li>Use reflective warning vests when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Wear hard hats, safety glasses with side shields, face shields and goggles, and steel-toe safety boots</li> <li>Understand and review hand signals</li> </ul>	Warning vest, Hard hat Safety glasses	

3.5.13

## JOB SAFETY ANALYSIS FOR EXCAVATION, MONITORING WELL ABANDONMENT

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; ≥5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; ≥5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Abandonment of Monitoring Wells (Continued)	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> <li>Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar motions</li> <li>Assure guards are in place to protect from these parts of equipment during operation</li> <li>Provide and use proper work gloves when the possibility of pinching, or other injury may be caused by moving/ handling large or heavy objects</li> <li>Maintain all equipment in a safe condition</li> <li>Keep all guards in place during use</li> <li>De-energize and lock-out machinery before maintenance or service</li> </ul>		
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants with workers before operations begin</li> </ul>	Tyvek coveralls, nitrile gloves, latex or neoprene boots (see Section 5.0 HASP)	LEL/O <sub>2</sub> , PID
	Underground/Overhead Utilities	<ul style="list-style-type: none"> <li>Identify all utilities around the site before work commences</li> <li>Cease work immediately if unknown utility markers are uncovered</li> <li>Use manual excavation within 3 feet of known utilities</li> <li>Utility clearance shall conform with 29 CFR 1926.955 (high voltage &gt;700 kv) 15 feet phase to ground clearance; 31 feet phase to phase clearance</li> </ul>		

3.5.13

## JOB SAFETY ANALYSIS FOR EXCAVATION, MONITORING WELL ABANDONMENT

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Abandonment of Monitoring Wells (Continued)	Electrical Shock	<ul style="list-style-type: none"> <li>De-energize or shut off utility lines at their source before work begins</li> <li>Use double insulated or properly grounded electric power-operated tools</li> <li>Maintain tools in a safe condition</li> <li>Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters</li> <li>Use qualified electricians to hook up electrical circuits</li> <li>Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation</li> <li>Cover or elevate electric wire or flexible cord passing through work areas to protect from damage</li> <li>Keep all plugs and receptacles out of water</li> <li>Use approved water-proof, weather-proof type if exposure is likely</li> <li>Inspect all electrical power circuits prior to commencing work</li> <li>Follow Lockout-Tagout procedures in accordance with OHM Health and Safety Procedures # 6-4</li> </ul>		
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures #3-4, 3-5</li> <li>Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

3.5.14

## JOB SAFETY ANALYSIS FOR LANDFILL CAP CONSTRUCTION

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Equipment	Monitoring Devices
Landfill Cap Construction	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools, construction debris and other materials</li> <li>Mark, identify, or barricade other obstructions</li> <li>Place temporary weights (sand bags) on liner materials if wind conditions are present</li> <li>Halt liner materials deployment for high winds/ severe weather</li> </ul>		
	Sprains and Strains	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> <li>Control pulling, placement of liner cap materials</li> <li>Prohibit running, jumping during placement of liner materials</li> <li>Prohibit over-filling or throwing of sand bags during placement of liner materials</li> </ul>		
	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> <li>Use reflective warning vests when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Barricade or enclose the work area</li> <li>Restrict work area entry to authorized personnel only during construction activities</li> <li>Wear hard hats, safety glasses with side shields, and steel-toe safety boots</li> <li>Understand and review hand signals</li> </ul>	Warning vests, Hard hat, Safety glasses	

3.5.14

## **JOB SAFETY ANALYSIS FOR LANDFILL CAP CONSTRUCTION**

### **AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Equipment</b>	<b>Monitoring Devices</b>
Landfill Cap Construction (Continued)	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter

3.5.14

## **JOB SAFETY ANALYSIS FOR LANDFILL CAP CONSTRUCTION**

### **AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Equipment</b>	<b>Monitoring Devices</b>
Landfill Cap Construction (Continued)	Electrical Shock	<ul style="list-style-type: none"> <li>De-energize or shut off utility lines at their source before work begins</li> <li>Use double insulated or properly grounded electric power-operated tools</li> <li>Maintain tools in a safe condition</li> <li>Inspect all electrical power circuits prior to commencing work</li> <li>Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters</li> <li>Use qualified electricians to hook up electrical circuits</li> <li>Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation</li> <li>Cover or elevate electric wire or flexible cord passing through work areas to protect from damage</li> <li>Keep all plugs and receptacles out of water</li> <li>Use approved water-proof, weather-proof type if exposure to moisture is likely</li> <li>Follow Lockout-Tagout procedures in accordance with OHM Health and Safety Procedures # 6-4</li> </ul>	Lockout/Tagout Devices	
	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> <li>Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar motions</li> <li>Assure guards are in place to protect from these parts of equipment during operation</li> <li>Provide and use proper work gloves when the possibility of pinching, or other injury may be caused by moving/handling large or heavy objects</li> <li>Maintain all equipment in a safe condition</li> <li>Keep all guards in place during use</li> <li>De-energize and lock-out machinery before maintenance or service</li> </ul>		



3.5.14

**JOB SAFETY ANALYSIS FOR LANDFILL CAP CONSTRUCTION**

**AIR MONITORING: "ACTION LEVELS"**

**PID:** <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

**MINI-RAM:** <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

**LEL/O<sub>2</sub>:** ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Equipment	Monitoring Devices
Landfill Cap Construction (Continued)	Burns	<ul style="list-style-type: none"><li>Use proper work gloves and protective clothing to protect workers from skin burns when welding liner seams</li></ul>	Leather gloves	
	Fire/ Explosion	<ul style="list-style-type: none"><li>Test beneath liner with combustible gas meter for flammable landfill gases when heat seaming liner materials and/or flammable materials are present</li><li>Eliminate sources of ignition from the work area</li><li>Prohibit smoking</li><li>Post "NO SMOKING" signs</li></ul>		LEL/O <sub>2</sub>
	High/Low Ambient Temperature	<ul style="list-style-type: none"><li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li><li>Provide fluids to prevent worker dehydration</li></ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment



3.5.15

## JOB SAFETY ANALYSIS FOR WELL INSTALLATION AND DEVELOPMENT

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Well Installation	Struck by/ Against Flying Particles, Protruding Objects	<ul style="list-style-type: none"> <li>Wear Hard hats, safety glasses with side shields and steel-toe safety boots at all times</li> <li>Wear splash shields and safety goggles when cleaning, decontaminating drilling equipment</li> </ul>	Hard hat, Safety glasses	
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> <li>Identify and understand parts of equipment which may cause crushing, pinching, rotating or similar injuries</li> <li>Assure guards are in place to protect from these parts of equipment during operation</li> <li>Provide and use proper work gloves when the possibility of pinching, or other injury may be caused by moving/ handling large or heavy objects</li> <li>Maintain all equipment in a safe condition</li> <li>Keep all guards in place during use</li> <li>De-energize and lock-out machinery before maintenance or service</li> </ul>		
	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Wizard or similar cut resistant gloves	

## 3.5.15

## JOB SAFETY ANALYSIS FOR WELL INSTALLATION AND DEVELOPMENT

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Well Installation (Continued)	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants before starting work</li> </ul>	Tyvek coveralls, nitrile gloves, latex or neoprene boots (see Section 5.0 HASP)	LEL/O <sub>2</sub> , PID
	Fire/ Explosion	<ul style="list-style-type: none"> <li>Test atmosphere with combustible gas meter</li> <li>Eliminate sources of ignition from the work area</li> <li>Prohibit smoking in well drilling area</li> <li>Provide ABC (or equivalent) fire extinguishers for all work and flammable storage areas, fuel powered generators and compressors</li> <li>Store flammable liquids in well ventilated areas</li> <li>Prohibit storage, transfer of flammable liquids in plastic containers</li> <li>Post "NO SMOKING" signs</li> <li>Store combustible materials away from flammables</li> <li>Store all compressed gas cylinders upright, caps in place when not in use</li> <li>Separate Flammables and Oxidizers by 20 feet minimum</li> </ul>		LEL/O <sub>2</sub>
Well Development	Inhalation and Contact with Hazardous Substances, Liquid Splash	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants with workers before sampling operations begin</li> <li>Wear splash shields and safety goggles when sampling, cleaning, decontaminating test equipment</li> </ul>	Tyvek coveralls, nitrile gloves, latex or neoprene boots (see Section 5.0 HASP)	LEL/O <sub>2</sub> , PID
	Flammable, Explosive Atmospheres	<ul style="list-style-type: none"> <li>Test well head atmosphere for flammable/toxic vapors</li> <li>Wear proper level of PPE for the type of atmospheric contaminants</li> <li>Eliminate sources of ignition from the work area</li> <li>Prohibit smoking in development area</li> </ul>	Tyvek coveralls, nitrile gloves, latex or neoprene boots (see Section 5.0 HASP)	LEL/O <sub>2</sub> , PID



3.5.15

**JOB SAFETY ANALYSIS FOR WELL INSTALLATION AND DEVELOPMENT**

**AIR MONITORING: "ACTION LEVELS"**

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Well Installation (Continued)	Struck by/ Against Flying Particles, Protruding Objects	<ul style="list-style-type: none"><li>Wear Hard hats, safety glasses with side shields and steel-toe safety boots at all times</li></ul>	Hard hat, Safety glasses	
	Handling Heavy Objects	<ul style="list-style-type: none"><li>Observe proper lifting techniques</li><li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li><li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li></ul>		
	Sharp Objects	<ul style="list-style-type: none"><li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li><li>Maintain all tools in a safe condition</li><li>Keep guards in place during use</li></ul>	Leather gloves	
	High/Low Ambient Temperature	<ul style="list-style-type: none"><li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li><li>Provide fluids to prevent worker dehydration</li></ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment



**3.5.16**

## **JOB SAFETY ANALYSIS FOR INSTALLATION OF STORMWATER CONTROLS**

### **AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Clothing and Equipment</b>	<b>Monitoring Devices</b>
Install Riprap, Diversion Berms, Piping, Retention Basins	Slips, Trips & Falls	<ul style="list-style-type: none"> <li>• Clear walkways, work areas of vegetation, equipment, tools, debris, excavated material</li> <li>• Mark, identify, or barricade other obstructions</li> <li>• Wear rubber boots in areas of standing water, mud, marsh</li> </ul>		
	Struck by/ Against Heavy Equipment, Flying Debris, Protruding Objects	<ul style="list-style-type: none"> <li>• Use reflective warning vests, caution flags when exposed to vehicular traffic</li> <li>• Place barricades to isolate equipment swing areas</li> <li>• Isolate areas under suspended loads</li> <li>• Make eye contact with operators before approaching equipment</li> <li>• Barricade or enclose the work area</li> <li>• Restrict entry to the work area to authorized personnel during work activities</li> <li>• Wear hard hats, safety glasses with side shields, face shields and goggles and steel-toe safety boots at all times</li> <li>• Understand and review hand signals</li> </ul>	Hard-hat, goggles and face shield or safety glasses	
	Sharp Objects	<ul style="list-style-type: none"> <li>• Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>• Maintain all hand and power tools in a safe condition</li> <li>• Keep guards in place during use</li> </ul>	Leather gloves	



**3.5.16**

## **JOB SAFETY ANALYSIS FOR INSTALLATION OF STORMWATER CONTROLS**

### **AIR MONITORING: "ACTION LEVELS"**

**PID:** <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

**MINI-RAM:** <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

**LEL/O<sub>2</sub>:** ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Install Riprap, Diversion Berms, Piping, Retention Basins (Continued)	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Avoid sudden movements, jerking motions</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Prohibit running, jumping during geotextile deployment</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Caught In/ Between Moving Parts	<ul style="list-style-type: none"> <li>Identify equipment operations which may cause crushing, pinching, rotating or similar motions</li> <li>Provide and use proper work gloves when the possibility of pinching or similar injury may be caused by moving/handling heavy objects</li> <li>Maintain communication between equipment operators and ground personnel</li> <li>Maintain all equipment in a safe condition</li> <li>Keep all guards in place during use</li> <li>Review positioning plan with workers before weir, riprap placement begins</li> </ul>	Leather gloves	
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter



3.5.16

**JOB SAFETY ANALYSIS FOR INSTALLATION OF STORMWATER CONTROLS**

**AIR MONITORING: "ACTION LEVELS"**

PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTELATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Install Riprap, Diversion Berms, Piping, Retention Basins (Continued)	High/Low Ambient Temperature	<ul style="list-style-type: none"><li>• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li><li>• Provide fluids to prevent worker dehydration</li></ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment



3.5.17

**JOB SAFETY ANALYSIS FOR FENCE INSTALLATION**

**AIR MONITORING: "ACTION LEVELS"**

**PID:** <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

**MINI-RAM:** <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

**LEL/O<sub>2</sub>:** ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Fence Installation	Sharp Objects	<ul style="list-style-type: none"> <li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li> <li>Maintain all hand and power tools in a safe condition</li> <li>Keep guards in place during use</li> </ul>	Leather gloves	
	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, tools, vegetation, excavated material, and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		
	Eye Injuries	<ul style="list-style-type: none"> <li>Wear face shield, goggles when operating powered clearing / grubbing equipment</li> </ul>	Goggles and face shield	
	High Noise Levels	<ul style="list-style-type: none"> <li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li> </ul>	Ear plugs	Sound Level Meter

**3.5.17**

## **JOB SAFETY ANALYSIS FOR FENCE INSTALLATION**

### **AIR MONITORING: "ACTION LEVELS"**

**PID: <1 PPM, LEVEL D; ≥1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B**

**MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B**

**LEL/O<sub>2</sub>: ≥10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING**

<b>Task Breakdown</b>	<b>Potential Hazards</b>	<b>Hazard Control Measures</b>	<b>Personal Protective Clothing and Equipment</b>	<b>Monitoring Devices</b>
Fence Installation (continued)	Electrical Shock	<ul style="list-style-type: none"> <li>• De-energize or shut off utility lines at their source before work begins</li> <li>• Use double insulated or properly grounded electric power-operated tools</li> <li>• Maintain tools in a safe condition</li> <li>• Provide an equipment-grounding conductor program or employ ground-fault circuit interrupters</li> <li>• Use qualified electricians to hook up electrical circuits</li> <li>• Inspect all extension cords daily for structural integrity, ground continuity, and damaged insulation</li> <li>• Cover or elevate electric wire or flexible cord passing through work areas to protect from damage</li> <li>• Keep all plugs and receptacles out of water</li> <li>• Use approved water-proof, weather-proof type if exposure to moisture is likely</li> <li>• Inspect all electrical power circuits prior to commencing work</li> <li>• Follow Lockout-Tagout procedures in accordance with OHM Health and Safety Procedures # 6-4</li> </ul>	Lockout/Tagout Devices	
	High/Low Ambient Temperature	<ul style="list-style-type: none"> <li>• Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li> <li>• Provide fluids to prevent worker dehydration</li> </ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment





3.5.18

## JOB SAFETY ANALYSIS FOR EQUIPMENT DECONTAMINATION

### AIR MONITORING: "ACTION LEVELS"

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Heavy Equipment & Vehicles	Slips, Trips, Falls	<ul style="list-style-type: none"> <li>Clear walkways, work areas of equipment, vegetation, tools and debris</li> <li>Mark, identify, or barricade other obstructions</li> </ul>		
	Struck by/Against Heavy Equipment, Protruding Objects, & Splashes	<ul style="list-style-type: none"> <li>Use reflective warning vests when exposed to vehicular traffic</li> <li>Isolate equipment swing areas</li> <li>Make eye contact with operators before approaching equipment</li> <li>Wear hard hats, safety glasses with side shields, or goggles with splash shields and steel-toe safety boots</li> <li>Understand and review hand signals</li> </ul>	Warning vests hard hat safety glasses, goggles and face shield	
	Inhalation and Contact with Hazardous Substances	<ul style="list-style-type: none"> <li>Provide workers proper skin, eye and respiratory protection based on the exposure hazards present</li> <li>Review hazardous properties of site contaminants with workers before operations begin</li> </ul>	PVC rain suit or Tyvek coveralls, nitrile or latex gloves, neoprene or latex boots (See Section 5.0 HASP)	
	Burns	<ul style="list-style-type: none"> <li>Use proper gloves, face shield/safety goggles, shin and toe guards, and splash suits to protect workers from skin burns and injury when operating laser (high pressure washers)</li> </ul>	Goggles and face shield, shin and toe guards	
	Handling Heavy Objects	<ul style="list-style-type: none"> <li>Observe proper lifting techniques</li> <li>Obey sensible lifting limits (60 lb. maximum per person manual lifting)</li> <li>Use mechanical lifting equipment (hand carts, trucks) to move large, awkward loads</li> </ul>		



3.5.18

**JOB SAFETY ANALYSIS FOR EQUIPMENT DECONTAMINATION**

**AIR MONITORING: "ACTION LEVELS"**

PID: <1 PPM, LEVEL D; ≥ 1 PPM <5 PPM, LEVEL C; >5 PPM LEVEL B

MINI-RAM: <0.5 MG/M<sup>3</sup> LEVEL D; ≥ 0.5 MG/M<sup>3</sup> <5.0 MG/M<sup>3</sup>, LEVEL C; >5.0 MG/M<sup>3</sup>, LEVEL B

LEL/O<sub>2</sub>: ≥ 10% LEL, STOP WORK, EVACUATE; <20.9% O<sub>2</sub>, LEVEL B; <19.5% O<sub>2</sub>, MECHANICAL VENTILATION, CONSTANT MONITORING

Task Breakdown	Potential Hazards	Hazard Control Measures	Personal Protective Clothing and Equipment	Monitoring Devices
Heavy Equipment & Vehicles (Continued)	Sharp Objects	<ul style="list-style-type: none"><li>Wear cut resistant work gloves when the possibility of lacerations or other injury may be caused by sharp edges or objects</li><li>Maintain all hand and power tools in a safe condition</li><li>Keep guards in place during use</li></ul>	Leather gloves	
	High Noise Levels	<ul style="list-style-type: none"><li>Use hearing protection when exposed to excessive noise levels (greater than 85 dBA over an 8-hour work period)</li></ul>	Ear plugs	Sound Level Meter
	High/Low Ambient Temperature	<ul style="list-style-type: none"><li>Monitor for Heat/Cold stress in accordance with OHM Health and Safety Procedures # 3-4, 3-5</li><li>Provide fluids to prevent worker dehydration</li></ul>	Insulated Clothing (subject to ambient temperature)	Meteorological Equipment

## **4.0 WORK AND SUPPORT AREAS**

---

To prevent migration of contamination from personnel and equipment work areas will be clearly specified prior to beginning operations. OHM has designated work areas or zones as suggested by the NIOSH/OSHA/USCG/EPA'S document titled, "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities." Each work area will be divided into three zones as follows:

- An Exclusion or "hot" Zone (EZ)
- A Contamination-Reduction Zone (CRZ)
- A Support Zone (SZ)

### **4.1 EXCLUSION ZONE**

The EZ is the area suspected of contamination and presents the greatest potential for worker exposure. Personnel entering the area must wear the mandated level of protection for that area. In certain instances, different levels of protection will be required depending on the tasks and monitoring performed within that zone. The EZ for this project will include the site drum locations, drum staging area, the tank excavation sites and the waste excavation sites around the ASTL.

### **4.2 CONTAMINATION REDUCTION ZONE**

The CRZ or transition zone will be established between the EZ and SZ. In this area, personnel will begin the sequential decontamination process required to exit the EZ. To prevent off-site migration of contamination and for personnel accountability, all personnel will enter and exit the EZ through the CRZ. The CRZ for this project will include the access/egress routes to/from the EZ and the personnel and equipment decontamination stations.

### **4.3 SUPPORT ZONE**

The SZ serves as a clean, control area. Operational support facilities are located within the SZ. Normal work clothing and support equipment are appropriate in this zone. Contaminated equipment or clothing will not be allowed in the SZ. The support facilities should be located upwind of site activities. There will be a clearly marked controlled access point from the SZ into the CRZ and EZ that is monitored closely by the SSO and the SS to ensure proper safety protocols are followed. The SZ for this project will include the crew and office locations, site parking areas and access roads.

### **4.4 SITE CONTROL LOG**

A log of all personnel visiting, entering or working on the site shall be maintained in the main office trailer location. The log will record the date, name, company or agency, and time entering or exiting the site.

No visitor will be allowed in the EZ without showing proof of training and medical certification, per 29 CFR 1910.120(e), (f). Visitors will supply their own boots and respiratory equipment, if required. Visitors will attend a site orientation given by the SSO and sign the HASP.

**4.5    GENERAL**

The following items are requirements to protect the health and safety of workers and will be discussed in the safety briefing prior to initiating work on the site:

- Eating, drinking, chewing gum or tobacco, smoking, or any practice that increases the probability of hand to mouth transfer and ingestion of contamination is prohibited in the EZ and CRZs.
- Hands and face must be washed upon leaving the EZ and before eating, drinking, chewing gum or tobacco and smoking or other activities which may result in ingestion of contamination.
- A buddy system will be used. Hand signals will be established to maintain communication.
- During site operations, each worker will consider himself as a safety backup to his partner. Off-site personnel provide emergency assistance. All personnel will be aware of dangerous situations that may develop.
- Visual contact will be maintained between buddies on site when performing hazardous duties.
- No personnel will be admitted to the site without the proper safety equipment, training, and medical surveillance certification.
- All personnel must comply with established safety procedures. Any staff member who does not comply with safety policy, as established by the SSO or the SS, will be immediately dismissed from the site.
- Proper decontamination procedures must be followed before leaving the site.
- All employees and visitors must sign in and out of the site.

## 5.0 PROTECTIVE EQUIPMENT

This section addresses the various levels of personal protective equipment (PPE) which are or may be required at this job site. OHM personnel are trained in the use of all PPE utilized.

### 5.1 ANTICIPATED PROTECTION LEVELS

The following protection levels have been established for the site work activities based on the information provided in Proposal Request concerning the levels of site contaminants and the scope of work. Results of site air monitoring and visual inspection of the work activities may indicate possible changes in PPE level(s).

TASK	PROTECTION LEVEL	COMMENTS/MODIFICATIONS
Site Setup, Erosion Control Installation, Clearing, Grubbing, Tree Felling, Construct Drum Staging Area, Access Road Construction, Borrow Area Development, Landfill Cap Installation, Stormwater Controls Installation, Fence Installation	Level D	Hardhat, steel-toe work boots, safety eye wear (safety glasses with side shields or goggles and face shield if splash or flying particles are likely) and hearing protection >85 dB A
Drum Excavation, Removal, Overpacking, Drum sampling	Level B	Saranex-coated Tyvek coveralls, nitrile gloves, neoprene boots and hearing protection >85 dB A; continuous air monitoring (see section 7.0)
Debris Removal	Level D+/C/B	Tyvek coveralls, nitrile gloves, neoprene boots and hearing protection >85 dB A; upgrade to Level C or Level B if air monitoring action levels are exceeded; and /or if Level C or B activities are taking place in the same area
Tank Excavation, Removal and Scrap	Level B/C	Saranex-coated Tyvek coveralls, nitrile gloves, neoprene boots and hearing protection >85 dB A; continuous air monitoring (see section 7.0); downgrade to Level C if air monitoring action levels permit and no other Level B activities are taking place in the same area
Waste Excavation/ Relocation, Rough Grading	Level D+/C/B	Tyvek coveralls, nitrile gloves, neoprene boots and hearing protection >85 dB A; upgrade to Level C or Level B if air monitoring action levels are exceeded; and /or if Level B activities are taking place in the same area

TASK	PROTECTION LEVEL	COMMENTS/MODIFICATIONS
Gas Vent System Installation, Well Abandonment	Level D+/C/B	Tyvek coveralls, nitrile gloves, neoprene boots and hearing protection >85 dB A; upgrade to Level C or Level B if air monitoring action levels are exceeded; and /or if Level B activities are taking place in the same area
New Well Installation	Level D+/C/B	Tyvek coveralls, nitrile gloves, neoprene boots and hearing protection >85 dB A; upgrade to Level C or Level B if air monitoring action levels are exceeded; and /or if Level C or B activities are taking place in the same area
Decontamination	Level D+	PVC rain suit or Tyvek coveralls, latex gloves, latex boots
General SZ Activities	Level D	

### 5.2 PROTECTION LEVEL DESCRIPTIONS

This section lists the minimum requirements for each protection level. Modification to these requirements will be noted above.

#### 5.2.1 Level D

Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots
- Work clothing as prescribed by weather
- Hearing protection >85 dB A

#### 5.2.2 Modified Level D

Modified Level D consists of the following:

- Safety glasses with side shields
- Hard hat
- Steel-toed work boots
- Nitrile, neoprene, latex or PVC over boots
- Outer nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)
- Tyvek coverall [Polyethylene-coated Tyveks required when workers have a potential to be exposed to contaminated liquids or sludges.]
- Hearing protection >85 dB A



### 5.2.3 Level C

Level C consists of the following:

- Full-face, air-purifying respirator with appropriate cartridges
- Hooded Tyvek Coveralls [Polyethylene-coated Tyveks required when workers have a potential to be exposed to contaminated liquids or sludges].
- Hard hat
- Steel-toed work boots
- Nitrile, neoprene, latex or PVC over boots
- Nitrile, neoprene, or PVC gloves over latex sample gloves
- Face shield (when projectiles or splashes pose a hazard)
- Hearing protection >85 dB A

### 5.2.4 Level B

Level B protection consists of the items required for Level C protection with the exception that an air-supplied respirator is used in place of the air-purifying respirator.

### 5.2.5 Level A

Level A protection consists of the items required for Level B protection with the addition of a fully-encapsulating, vapor-proof suit capable of maintaining positive pressure.

## 5.3 SUPPLIED-AIR RESPIRATORS

If air monitoring shows that Level B protection is needed, OHM personnel will wear Survivair 9881-02 Hippack Airline respirators with 5-minute egress bottles. Personnel requiring Level "B" protection and high mobility will wear Survivair Mark 2 SCBA units.

## 5.4 BREATHING-AIR QUALITY

Code of Federal Regulations 29 CFR 1910.134 states breathing air will meet the requirement of the specification for Grade D breathing air as described in the ANSI/CGA Specification G-7.1-1989. OHM requires a certificate of analysis from vendors of breathing air in order to show that the air meets this standard. Breathing air will be obtained in cylinders exclusively and will be stationed in the exclusion zone (EZ).

## 5.5 AIR-PURIFYING RESPIRATORS

A NIOSH-approved full-face respirator with appropriate air-purifying cartridges will be used for Level C work.

## 5.6 RESPIRATOR CARTRIDGES

The crew members working in Level C will wear respirators equipped with air-purifying cartridges approved for the following contaminants.

- Organic vapors <1,000 ppm
- Chlorine gas <10 ppm



- Hydrogen chloride <50 ppm
- Sulfur dioxide <50 ppm
- Dusts, fumes and mists with a TWA <0.05 mg/m<sup>3</sup>
- Asbestos-containing dusts and mists
- Radionuclides
- Pesticides

### **5.7 CARTRIDGE CHANGES**

All cartridges will be changed a minimum of once weekly, or more frequently if personnel begin to experience increased inhalation resistance or breakthrough of a chemical warning property.

### **5.8 INSPECTION AND CLEANING**

Respirators are checked periodically by a qualified individual and inspected before each use by the wearer. All respirators and associated equipment will be decontaminated and hygienically cleaned after each use.

### **5.9 FIT TESTING**

Annual respirator fit tests are required of all personnel wearing negative-pressure respirators. The test will use isoamyl acetate or irritant smoke. The fit test must be for the style and size of the respirator to be used.

### **5.10 FACIAL HAIR**

Personnel who have facial hair which interferes with the respirator's sealing surface will not be permitted to wear a respirator and will not be permitted to work in areas requiring respirator use.

### **5.11 CORRECTIVE LENSES**

Normal eyeglasses cannot be worn under full-face respirators because the temple bars interfere with the respirator's sealing surfaces. For workers requiring corrective lenses, special spectacles designed for use with respirators will be provided.

### **5.12 CONTACT LENSES**

Contact lenses will not be worn with any type of respirator.

### **5.13 MEDICAL CERTIFICATION**

Only workers who have been certified by a physician as being physically capable of respirator usage will be issued a respirator. Personnel unable to pass a respiratory fit test or without medical clearance for respirator use will not be permitted to enter or work in areas on site that require respiratory protection. Employees receive a written physicians opinion that they are fit for general hazardous waste operations as per 29 CFR 1910.120(f)(7).





### **5.14 SITE SPECIFIC PERSONAL PROTECTIVE EQUIPMENT (PPE) PROGRAM**

The primary objective of the PPE program is to ensure employee protection and to prevent employee exposure to site contaminants during site operations. Engineering controls are not feasible for many tasks and, therefore, require the use of PPE.

The SS will be responsible for implementing all aspects of the PPE program. This includes donning and doffing, temperature related stress monitoring, inspection, and decontamination (see Section 6.0). PPE selection is identified in Table 5.1 for each specified task. The SS in consultation with the SSO, if assigned, Health and Safety Manager and project CIH will direct changes in PPE based on changing conditions. The site specific HASP will serve as written certification that the workplace was evaluated concerning PPE requirements. OHM Corporation's comprehensive PPE Program is described in Appendix D.

#### **5.14.1 Site-Specific Respiratory Protection Program**

The primary objective of respiratory protection is to prevent employee exposure to atmospheric contamination. When engineering measures to control contamination are not feasible, or while they are being implemented, personal respiratory protective devices will be used.

The criteria for determining respirator need have been evaluated based on the site contaminants; expected levels of protection are outlined in Section 5.1. Air monitoring will be conducted to confirm that respiratory protection levels are adequate (Section 7.0). All respirator users are OSHA trained in proper respirator use and maintenance. The SS and SSO will observe workers during respirator use for signs of stress. The SS, CIH, HSM, and SSO will also evaluate this HASP periodically to determine its continued effectiveness with regard to respiratory protection. All persons assigned to use respirators will have medical clearance to do so.

## 6.0 DECONTAMINATION PROCEDURES

---

This section describes the procedures necessary to ensure that both personnel and equipment are free from contamination when they leave the work site.

### 6.1 PERSONNEL DECONTAMINATION

Decontamination procedures will ensure that material which workers may have contacted in the EZ does not result in personal exposure and is not spread to clean areas of the site. This sequence describes the general decontamination procedures for Level C, Level B/Egress, and Level B/SCBA. The specific stages will vary depending on the site, the task, the protection level, etc. Dry decontamination may be used if appropriate and there is insufficient space to support a full decontamination station as delineated with the steps below. The SS, or the SSO, if assigned, will ensure that the decontamination procedures are adequate.

#### Level D+ Decontamination

1. Go to end of EZ
2. Remove and discard latex booties
3. Remove outer gloves and discard
4. Cross into CRZ (dirty side of respirator wash area)
5. Remove protective suit (polycoated/regular Tyvek)
6. Remove inner sample gloves and discard
7. Wash face and hands

#### Level C Decontamination

1. Go to end of EZ
2.
  - a. Wash outer boots (Tingley or Robars) and stage to let dry; or
  - b. Remove and discard latex booties
3. Remove outer gloves and discard
4. Remove outer suit (Saranex/polycoated/regular tyvek)
5. Remove outer sample gloves and discard
6. Cross into CRZ (dirty side of respirator wash area)
7. Remove inner suit and discard, (if applicable)
8. Remove and wash respirator (4 stages)
  - a. Soap and water solution
  - b. First rinse
  - c. Disinfect respirator (1 cap full of bleach to 1 gallon of water)
  - d. Final rinse
9. Hang respirator to dry
10. Remove inner sample gloves and discard
11. Wash face and hands

#### Level B Decontamination (Airline/Egress)

1. Go to end of EZ
2.
  - a. Wash outer boots (Tingley or Robars) and stage to let dry; or

- b. Remove and discard latex booties
3. Remove outer gloves and discard
4. Cross into CRZ
5. Disconnect airline, remove egress system, and disconnect egress from mask
6. Stage egress bottle for cleaning
7. Remove outer suit
8. Remove outer sample gloves and discard
9. Move to respirator wash area, and wash egress mask and related hose line
  - a. Soap and water solution
  - b. First rinse
  - c. Disinfect respirator (1 cap full of bleach to 1 gallon of water)
  - d. Final rinse
10. Hang egress mask (upside down) and line to dry
11. Remove inner sample gloves and discard.
12. Wash face and hands

**Level B Decontamination (SCBA)**

1. Move to edge of EZ
2. Bottle change only
  - a. Wash boots and gloves
  - b. Move to edge of EZ and CRZ
  - c. Remove face mask airline from regulator assembly
  - d. Allow assistant to change bottle and reconnect face mask airline
  - e. Return to EZ
3.
  - a. Wash outer boots and stage to let dry (Tingley or Robars only); or
  - b. Remove and discard latex booties
4. Remove and discard outer gloves
5. Disconnect from SCBA bottle and stage SCBA (NOTE: SCBA mask remains on)
6. Remove outer suit (Saranex/polycoated/regulartyvek)
7. Remove outer sample gloves and discard
8. Cross into CRZ
9. Remove inner suit (if applicable)
10. Move to respirator wash area and wash SCBA facepiece and hose line
  - a. Soap and water solution
  - b. First rinse
  - c. Disinfect respirator (1 cap full of bleach to 1 gallon of water)
  - d. Final rinse
11. Hang mask to dry
12. Remove inner sample gloves and discard
13. Wash face and hands

**6.1.1 Suspected Contamination**

Any employee suspected of sustaining skin contact with chemical materials will first use the emergency shower. Following a thorough drenching, the worker will proceed to the decontamination facility. Here the worker will remove clothing, shower, don clean clothing, and immediately be taken to the first-aid station. Medical attention will be provided as determined by the degree of injury.

### **6.1.2 Personal Hygiene**

Following decontamination and before any eating, smoking, or drinking, personnel will wash hands, arms, neck and face.

### **6.2 EQUIPMENT DECONTAMINATION**

All contaminated equipment will be decontaminated before leaving the site. Decontamination procedures will vary depending upon the contaminant involved, but may include sweeping, wiping, scraping, hosing, or steaming the exterior of the equipment. Personnel performing this task will wear the proper PPE as prescribed by the SSO.

### **6.3 DISPOSAL**

All decontamination liquids and disposable clothing will be treated as contaminated waste unless determined otherwise by accepted testing methods. Wastes will be disposed of according to state and federal regulations.

## 7.0 AIR MONITORING

Air monitoring will be conducted in order to characterize personnel exposures and fugitive emissions from site contaminants. Principal contaminants of concern are listed in Section 3.0 of this HASP. The target compounds selected for air monitoring purposes for this site include total dust, PCBs and VOCs. Results of air monitoring will be used to ensure the proper selection of protective clothing and equipment, including respiratory protection, to protect on-site personnel and off-site receptors from exposure to unacceptable levels of site contaminants. Descriptions of air monitoring strategies, procedures and equipment are provided below. Modification of this plan, including additional monitoring, may be considered as judged necessary by the Project CIH, in conjunction with the HSM and SSO.

### 7.1 WORK AREA AIR MONITORING

Work area air monitoring at Albion-Sheridan Landfill site will include direct reading methods as well as integrated sampling strategies. Air monitoring will be conducted during drum excavation and sampling, waste excavation and consolidation, tank excavation and monitoring well abandonment and installation.

#### 7.1.1 Direct Reading Air Monitoring

During drum excavation and sampling, waste excavation and consolidation, tank excavation and monitoring well abandonment and installation direct reading air monitoring will be performed in the EZ to determine exposure to workers. A PID will be used to monitor VOCs during these activities. An LEL/O<sub>2</sub> will be used to monitor for flammable/ explosive vapors. A summary of air monitoring information is provided in the table below.

Monitoring Device	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	Action
LEL/O <sub>2</sub>	Exclusion Zone (EZ) Excavation area; Equipment Operator (EO), Recovery Tech (RT)	Initially during excavation/hot work; periodically after start of work activities	>10% LEL <20.8% O <sub>2</sub>	Evacuate area, ventilate, upgrade to Level B if necessary, continue to monitor
PID	EZ Excavation area/ EO, RT	Continuous during excavation	> 1 ppm*  1-25 ppm* 25- 100 ppm* 100-500 ppm* >500 ppm*	Continue PID sampling, sample with vinyl chloride colorimetric tube Level D Level C Level B Level A
Colorimetric Tube Vinyl Chloride	EZ area/ EO, RT	Periodically during excavation	< 1 ppm ≥ 1 ppm ≤ 25 ppm > 25 ppm	Level D Level C Level B



Monitoring Device	Monitoring Location/ Personnel	Monitoring Frequency	Action Level	Action
Mini-Ram (total dust)	EZ area/ EO, RT	Continuous during excavation of	< 5.0 mg/m <sup>3</sup> (15 minute TWA)	Level D
			≥ 5.0 mg/m <sup>3</sup> - ≤ 10.0 mg/m <sup>3</sup> ( 15 minute TWA)	Level C
			> 10.0 mg/m <sup>3</sup> (15 minute TWA)	Level B

\*Sustained levels above background for 5 minutes

## 7.2 PERIMETER AIR MONITORING

This sampling is required by contract specification. Perimeter air monitoring activities will be undertaken during drum excavation activities. These air monitoring activities will include integrated air monitoring for VOCs using Summa Canisters.

### 7.2.1 Integrated Sampling

Integrated sampling will be conducted at one downwind location during drum excavation activities. During the first 3 days of drum excavation activities, samples will be drawn daily and submitted to the laboratory for analysis. These Samples are required by client request.

Monitoring Device	Monitoring Location	Monitoring Frequency	Action Level	Action
Summa Canister USEPA TO- 14	One downwind of the drum excavation activities	Daily during first 3 days of drum sampling	Varies with compound	Report results to client

## 7.3 INSTRUMENTATION

The following is a description of the air monitoring equipment to be used at this site.

### 7.3.1 Lower Explosive Limit/Oxygen (LEL/O<sub>2</sub>) Meter

#### 7.3.1.1 Types and Operational Aspects

- MSA Watchman LEL/O<sub>2</sub> Meter or equivalent
  - Principle of Operation
    - Oxygen detector uses an electrochemical sensor; produces a minute electric current proportional to the oxygen content.

- Combustible gas indicators use a combustion chamber containing a filament that ignites flammable vapors; filament is heated or coated with a catalyst (platinum) to facilitate combustion.
- Filament is part of a balanced resistor circuit; combustion in the chamber causes the filament temperature to increase; results in increased filament resistance.
- Change in the filament's resistance causes an imbalance in the circuit proportional to the percent of the lower explosive limit (% LEL).
- Concentrations greater than the LEL and lower than the upper explosive limit (UEL) will read 100% LEL; combustible atmosphere present.
- Concentrations greater than the UEL will read above 100% LEL then return to zero. (NOTE: Some devices have catchment mechanisms which will cause the needle to remain at 100% until the meter is reset.) This type of response indicates the gas mixture is too rich to burn and is not combustible. The danger is that the addition of air to the gas mixture could bring it into the flammable range (less than the UEL).
- Oxygen meter set at the factory to alarm at 19.5% (oxygen deficient atmosphere) combustible gas meter set by the user to alarm at 10% LEL.

#### 7.3.1.2 Calibration Methods/Frequencies

Before the calibration of the combustible gas indicator can be checked, the unit must be in operating condition. The combustible gas indicator (LEL) is normally calibrated on pentane as being representative of the flammability characteristics of most commonly encountered combustible gases. The meter scale is calibrated from zero to 100% LEL, which corresponds in actual volume concentrations of 0 to approximately 14% pentane in air. A booklet of response curves is supplied with the Watchman Meter. These curves may be used to interpret meter readings when sampling combustible gases other than pentane.

It is recommended that calibration be checked before and after using each time. The SSO will record and log such calibration information into an air monitoring notebook. The O<sub>2</sub> meter is calibrated by adjusting the O<sub>2</sub> control knob to 20.8% while the meter is operated in a fresh air atmosphere.

#### 7.3.1.3 Preventative Maintenance

The primary maintenance of unit is the rechargeable 2.4 volt nickel cadmium battery. Recommended charging time is 16 hours. It may be left on charge for longer periods without damaging the battery. The battery sometimes will not supply full power capacity after repeated partial use between charging. Therefore, it is recommended that the battery be exercised at least once a month by running for eight to 10 hours and recharged. If the instrument has not been used for 30 days, the battery should be charged prior to use.

### 7.3.2 **Photoionization Detector (PID)**

#### 7.3.2.1 Type and Operational Aspects

- PID Model PI 101 or equivalent

### - Principle of Operation

- Ionization potential (IP) - The energy required to remove the outermost electron from a molecule; measured in electron volts (eV); characteristic property of a specific chemical.
- Photoionization - Using ultraviolet (UV) light to remove the outermost electron from a molecule.
- Energy of UV light (10.2, 9.5, 11.7 eV) must be equal to or greater than the IP to photoionize the molecule.
- Fan or pump is used to draw air into the detector where the contaminants are exposed to a UV light source (lamp).
- Ions are collected on a charged plate and produce a current directly proportional to the number of ionized molecules; current is amplified and displayed on the meter.

#### 7.3.2.2 Calibration Method/Frequencies

The PID Model PI 101 is designed for trace gas analysis in ambient air and is calibrated at HNU with certified standards of benzene, vinyl chloride, and isobutylene. Other optional calibrations are available (e.g., ammonia, ethylene oxide, H<sub>2</sub>S, etc.).

OHM will use a PID with a 10.2 eV lamp. This lamp has been determined to be most responsive to the contaminants on site. Optional probes containing lamps of 9.5 and 11.7 eV are interchangeable in use within individual read-out assemblies for different applications.

The approximate span settings for the probe that would give different readings of the amounts of trace gas of a particular species in a sample are based upon the relative photoionization sensitivities of various gases twice daily (beginning and end of shift).

It is recommended that calibration be checked twice each day (beginning and end of shift). The SSO will record and log such calibration information into an air monitoring notebook.

#### 7.3.2.3 Preventative Maintenance

Maintenance of the PID Model PI 101 consists of cleaning the lamp and ion chamber, and replacement of the lamp or other component parts or sub-assemblies.

### 7.3.3 **Portable Total Dust Monitor**

#### 7.3.3.1 Type and Operational Aspects

- Real-Time Aerosol Monitor (Mini Ram Model PDM-3 and Model Pr100 Data Ram)
  - Principle of Operation
    - Detection of light in the near infrared region back-scattered to a sensor (photovoltaic detector) by airborne particulate in a sensing volume





- The higher the dust concentration the more back-scattering of light to the sensor, resulting in increased readings
- Device calibrated at the factory against an air sampling filter/gravimetric analysis reference method

### 7.3.3.2 Calibration Methods/Frequencies

There is no calibration method or procedure for calibrating the mini-ram monitor. However, it is recommended that the mini-ram monitor be re-zeroed once a week. During a zero check, the sampled air passes through the purge air filter and dryer to effect a self-cleaning of the optical chamber.

### 7.3.3.3 Preventative Maintenance

Maintenance of the mini-ram consists of replacement of filters and desiccant; battery replacement; and cleaning of the optical detection assembly.

## 7.3.4 COLORIMETRIC DETECTOR TUBES

### 7.3.4.1 Type and Operational Aspects

The CIH will select a specific colorimetric detector tube for a specific chemical.

- Drager Multi Glass Detector Model 21/31
  - Principle of Operation
    - Colorimetric indicator tubes (detector tubes) consist of a glass tube impregnated with an indicating chemical.
    - Tube is connected to a piston or bellows pump to draw a known volume of air through the tube.
    - Contaminant reacts with the indicator chemical in the tube, producing a change in color whose length is proportional to the contaminant concentration; glass tube has graduations in ppm to match the length of stain.
    - Preconditioning filter may precede the detector tube to remove interfering contaminants (benzene, vinyl chloride).

### 7.3.4.2 Calibration Methods/Frequencies

There is no method or procedure for calibrating any colorimetric detector tube. However, it is important to read the instructions provided with a specific detector tube to determine number of pump strokes, interfering chemicals, proper color change, and shelf life. It is important that the number of strokes is not exceeded on the first measurement, as this may overload the tube and overshoot the standard range of measurement.

Sampling pump can be checked but not calibrated using the bubble tube. All bellows pumps draw in a specific amount of air during each stroke. This amount should correspond to a specific amount on the bubble tube (i.e., if one stroke equals 100 cc, then the bubble should move 100 cc in the bubble tube). Also, a leak check can be conducted by activating a pump stroke, then inserting an unopened colorimetric tube in the pump inlet. The pump should not move, if it does, this indicates a leak. If the pump fails either the leak test or the volume test, return it back to the manufacturer for repair.

#### 7.3.4.3 Preventative Maintenance

Generally speaking, the reagent of the colorimetric tubes cannot be stored for unlimited periods. The shelf life of the Drager tubes are, therefore, limited to two years (for storage at room temperature).

#### 7.3.5 **Summa Canister**

##### 7.3.5.1 Type and Operational Aspects

- Summa Canister
- Principle of Operation
  - The Summa Canister is fitted with a fixed flow rate valve calibrated to draw a specified air flow rate (liters per minute). The canister purged and evacuated at the originating laboratory and sent to the testing location. The valve is attached and opened and the number of minutes the valve remains open is recorded. The canister is then returned to the laboratory for analysis.
  - Volume of air sampled is then calculated as follows:

$$\text{Flow rate (liter/min.)} \times \text{sample time (min.)} = \text{sample volume (liters)}$$

##### 7.3.5.2 Calibration Methods/Frequencies

The fixed rate flow valve is preset by the source laboratory or manufacturer of the cannister to the flow rate requested in the field. No calibration or resetting of the valve can be performed without proper training and damaged or defective equipment can not be used.

##### 7.3.5.3 Preventative Maintenance

Summa canisters are set and maintained by factory or trained laboratory personnel. Preventative maintenance in the field consists of physical inspection of the containers and flow valves. Defective equipment must be returned for service.

#### 7.4 **AIR MONITORING RECORDKEEPING**

The SSO will ensure that all air-monitoring data is logged according to OHM Procedure 5-2 and Northern Region Policy: Employee Exposure Monitoring Recordkeeping Procedures. Data will include instrument used, wind direction, work process, etc. The OHM Project CIH may periodically review this data.



**7.5 CALIBRATION REQUIREMENTS**

The PID, LEL/O<sub>2</sub> meter and sampling pumps required with fixed-media air sampling will be calibrated daily before and after use. A separate log will be kept detailing date, time, span gas, or other standard, and name of person performing the calibration.

**7.6 AIR MONITORING RESULTS**

Air monitoring results will be posted for personnel inspection, and will be discussed during morning safety meetings. Personal air sampling results will be forwarded to the OHM Corporate Health and Safety Manager for Medical Surveillance, to be incorporated into the employee(s)' medical records.

## 8.0 EMERGENCY RESPONSE AND CONTINGENCY PLAN

---

### 8.1 PRE-EMERGENCY PLANNING

Prior to engaging in construction/remediation activities at the site, OHM will plan for possible emergency situations and have available adequate supplies and manpower to respond. In addition site personnel will receive training during the site orientation concerning proper emergency response procedures.

The following situations would warrant implementation of the Emergency Response and Contingency Plan (ERCP):

Fire/Explosion	<ul style="list-style-type: none"><li>• The potential for human injury exists.</li><li>• Toxic fumes or vapors are released.</li><li>• The fire could spread on site or off site and possibly ignite other flammable materials or cause heat-induced explosions.</li><li>• The use of water and/or chemical fire suppressants could result in contaminated run-off.</li><li>• An imminent danger of explosion exists.</li></ul>
Spill or Release of Hazardous Materials	<ul style="list-style-type: none"><li>• The spill could result in the release of flammable liquids or vapors, thus causing a fire or gas explosion hazard.</li><li>• The spill could cause the release of toxic liquids or fumes in sufficient quantities or in a manner that is hazardous to or could endanger human health.</li></ul>
Natural Disaster	<ul style="list-style-type: none"><li>• A rain storm exceeds the flash flood level.</li><li>• The facility is in a projected tornado path or a tornado has damaged facility property.</li><li>• Severe wind gusts are forecasted or have occurred and have caused damage to the facility.</li></ul>
Medical Emergency	<ul style="list-style-type: none"><li>• Overexposure to hazardous materials.</li><li>• Trauma injuries (broken bones, severe lacerations/bleeding, burns).</li><li>• Eye/skin contact with hazardous materials.</li><li>• Loss of consciousness.</li><li>• Heat stress (Heat stroke).</li><li>• Cold stress (Hypothermia).</li><li>• Heart attack.</li><li>• Respiratory failure.</li><li>• Allergic reaction.</li></ul>

The following measures will be taken to assure the availability of adequate equipment and manpower resources:

- Sufficient equipment and materials will be kept on site and dedicated for emergencies only. The inventory will be replenished after each use.

- Daily safety meeting
- Task-specific training prior to commencement of activity
- Lock-out/tag-out
- Personal Protective Equipment (PPE) selection/use
- Written and approved permits for hot work, confined space
- Trenching/shoring procedure
- Air monitoring
- Following all OHM standard operating procedures
- Practice drills for fire, medical emergency, and hazardous substances spills

TABLE 8.1 EMERGENCY TELEPHONE NUMBERS	
<u>Local Agencies</u>	
Sheridan & Albion Fire Department	517-629-9152
Calhoun County Police	517-629-9141
<u>Hospital</u>	
Albion Community Hospital, 809 W Erie St, Albion, Michigan	517-629-2191
<i>Directions: From the site turn Left on East Erie Rd; Follow E Erie into Albion, Cross Rt 99 continue on W Erie St., Hospital is on Left between Culver St. &amp; Gale St.</i>	
Regional Poison Control Center	800-962-1253
<u>State Agencies</u>	
Michigan Environmental Quality Dept.	517-373-8815
<u>Federal Agencies</u>	
EPA Region Branch Response Center - Chicago, IL	312-353-2117
National Response Center	800-424-8802
<u>OHM Personnel</u>	
Project Manager - Jim Kujawa	419-425-6322
District Health and Safety Manager - Mike Zustra	508-497-6125
Director, Health and Safety - Kevin McMahon	609-588-6375
OHM Corporation (24 hour)	800-537-9540
Additional Phone #'s in Section 2 this HASP	

### 8.3 PERSONNEL ROLES, LINES OF AUTHORITY, AND COMMUNICATIONS

This section of the ERCP describes the various roles, responsibilities, and communication procedures that will be followed by personnel involved in emergency responses.

The primary emergency coordinator for this site is the Site Supervisor. In the event an emergency occurs and the emergency coordinator is not on site, the Site Safety Officer or the highest ranking employee on site will serve as the emergency coordinator until he arrives. The emergency coordinator will determine the nature of the emergency and take appropriate action as defined by this ERCP.

The emergency coordinator will implement the ERCP immediately as required. The decision to implement the plan will depend upon whether the actual incident threatens human health or the environment. Immediately after being notified of an emergency incident, the emergency coordinator or his designee will evaluate the situation to determine the appropriate action.

### **8.3.1 Responsibilities and Duties**

This section describes the responsibilities and duties assigned to the emergency coordinator.

It is recognized that the structure of the "Incident Command System" will change as additional response organizations are added. OHM will follow procedures as directed by the fire department, LEPC, State and Federal Agencies as required. OHM will defer to the local Fire Department chief to assume the role of Incident Commander upon arriving on site. Additional on-site personnel may be added to the Site Emergency Response Team as required to respond effectively.

### **8.3.2 On-Site Emergency Coordinator Duties**

The on-site emergency coordinator is responsible for implementing and directing the emergency procedures. All emergency personnel and their communications will be coordinated through the emergency coordinator. Specific duties are as follows:

- Identify the source and character of the incident, type and quantity of any release. Assess possible hazards to human health or the environment that may result directly from the problem or its control.
- Discontinue operations in the vicinity of the incident if necessary to ensure that fires, explosions, or spills do not recur or spread to other parts of the site. While operations are dormant, monitor for leaks, pressure build-up, gas generation, or ruptures in valves, pipes, or other equipment, where appropriate.
- Notify local Emergency Response Teams if their help is necessary to control the incident. Table 8.1 provides telephone numbers for emergency assistance.
- Direct on-site personnel to control the incident until, if necessary, outside help arrives. Specifically:
- Ensure that the building or area where the incident occurred and the surrounding area are evacuated and shut off possible ignition sources, if appropriate. The Emergency Response Team is responsible for directing site personnel such that they avoid the area of the incident and leave emergency control procedures unobstructed.
- If fire or explosion is involved, notify local Fire Department.
- Have protected personnel, in appropriate PPE, on standby for rescue.

If the incident may threaten human health or the environment outside of the site, the emergency coordinator should immediately determine whether evacuation of area outside of the site may be necessary and, if so, notify the Police Department and the Office of Emergency Management.

When required, notify the National Response Center. The following information should be provided to the National Response Center:

- Name and telephone number
- Name and address of facility
- Time and type of incident
- Name and quantity of materials involved, if known
- Extent of injuries
- Possible hazards to human health or the environment outside of the facility.

The emergency telephone number for the National Response Center is 800-424-8802.

If hazardous waste has been released or produced through control of the incident, ensure that:

- Waste is collected and contained.
- Containers of waste are removed or isolated from the immediate site of the emergency.
- Treatment or storage of the recovered waste, contaminated soil or surface water, or any other material that results from the incident or its control is provided.
- Ensure that no waste that is incompatible with released material is treated or stored in the facility until cleanup procedures are completed.
- Ensure that all emergency equipment used is decontaminated, recharged, and fit for its intended use before operations are resumed.
- Notify the USEPA Regional Administrator that cleanup procedures have been completed and that all emergency equipment is fit for its intended use before resuming operations in the affected area of the facility. The USEPA Regional Administrator's telephone number is included in the Emergency Contacts.
- Record time, date, and details of the incident, and submit a written report to the USEPA Regional Administrator. Report is due to USEPA within 15 days of the incident.

## **8.4 SAFE DISTANCES AND PLACES OF REFUGE**

The emergency coordinator for all activities will be the Response Manager. No single recommendation can be made for evacuation or safe distances because of the wide variety of emergencies which could occur. Safe distances can only be determined at the time of an emergency based on a combination of site and incident-specific criteria. However, the following measures are established to serve as general guidelines.

In the event of minor hazardous materials releases (small spills of low toxicity), workers in the affected area will report initially to the contamination reduction zone. Small spills or leaks (generally less than 55 gallons) will require initial evacuation of at least 50 feet in all directions to allow for cleanup and to prevent exposure. After initial assessment of the extent of the release and potential hazards, the emergency

# ***EMERGENCY RESPONSE AND CONTINGENCY PLAN***

coordinator or his designee will determine the specific boundaries for evacuation. Appropriate steps such as caution tape, rope, traffic cones, barricades, or personal monitors will be used to secure the boundaries.

In the event of a major hazardous material release (large spills of high toxicity/greater than 55 gallons), workers will be evacuated from the building/site. Workers will assemble at the entrance to the site for a head count by their foremen and to await further instruction.

If an incident may threaten the health or safety of the surrounding community, the public will be informed and, if necessary, evacuated from the area. The emergency coordinator, or his designee will inform the proper agencies in the event that this is necessary. Telephone numbers are listed in Table 8.1.

Places of refuge will be established prior to the commencement of activities. These areas must be identified for the following incidents:

- Chemical release
- Fire/explosion
- Power loss
- Medical emergency
- Hazardous weather

In general, evacuation will be made to the crew trailers, unless the emergency coordinator determines otherwise. It is the responsibility of the emergency coordinator to determine when it is necessary to evacuate personnel to off-site locations.

In the event of an emergency evacuation, all the employees will gather at the entrance to the site until a head count establishes that all are present and accounted for. No one is to leave the site without notifying the emergency coordinator.

## **8.5 EVACUATION ROUTES AND PROCEDURES**

All emergencies require prompt and deliberate action. In the event of an emergency, it will be necessary to follow an established set of procedures. Such established procedures will be followed as closely as possible. However, in specific emergency situations, the emergency coordinator may deviate from the procedures to provide a more effective plan for bringing the situation under control. The emergency coordinator is responsible for determining which situations require site evacuation.

### **8.5.1 Evacuation Signals and Routes**

Two-way radio communication and an air horn will be used to notify employees of the necessity to evacuate an area or building involved in a release/spill of a hazardous material. Each crew supervisor will have a two way radio. A base station will be installed in the OHM office trailer to monitor for emergencies. Total site evacuation will be initiated only by the emergency coordinator, however, in his absence, decision to preserve the health and safety of employees will take precedence. Evacuation routes will be posted in each outside work area. Signs inside buildings will be posted on walls or other structural element of a building. Periodic drills will be conducted to familiarize each employee with the proper routes and procedures.





## 8.5.2 Evacuation Procedures

In the event evacuation is necessary, the following actions will be taken:

- The emergency signal will be activated.
- No further entry of visitors, contractors, or trucks will be permitted. Vehicle traffic within the site will cease in order to allow safe exit of personnel and movement of emergency equipment.
- Shut off all machinery if safe to do so.
- ALL on-site personnel, visitors, and contractors in the support zone will assemble at the entrance to the site for a head count and await further instruction from the emergency coordinator.
- ALL persons in the exclusion zone and contamination reduction zone will be accounted for by their immediate crew leaders (e.g., foreman). Leaders will determine the safest exits for employees and will also choose an alternate exit if the first choice is inaccessible.
- During exit, the crew leader should try to keep the group together. Immediately upon exit, the crew leader will account for all employees in his crew.
- Upon completion of the head count, the crew leader will provide the information to the emergency coordinator.
- Contract personnel and visitors will also be accounted for.
- The names of emergency response team members involved will be reported to the emergency spill control coordinator.
- A final tally of persons will be made by the emergency coordinator or designee. No attempt to find persons not accounted for will involve endangering lives of OHM or other employees by re-entry into emergency areas.
- In all questions of accountability, immediate crew leaders will be held responsible for those persons reporting to them. Visitors will be the responsibility of those employees they are seeing. Contractors and truck drivers are the responsibility of the Site Supervisor. The security guard will aid in accounting for visitors, contractors, and truckers by reference to sign-in sheets available from the guard shack.
- Personnel will be assigned by the emergency coordinator to be available at the main gate to direct and brief emergency responders.
- Re-entry into the site will be made only after clearance is given by the emergency coordinator. At his direction, a signal or other notification will be given for re-entry into the facility.
- Drills will be held periodically to practice all of these procedures and will be treated with the same seriousness as an actual emergency.

**8.6 EMERGENCY SPILL RESPONSE PROCEDURES AND EQUIPMENT**

In the event of an emergency involving a hazardous material spill or release, the following general procedures will be used for rapid and safe response and control of the situation. Emergency contacts found in Table 8.1 provide a quick reference guide to follow in the event of a major spill.

**8.6.1 Notification Procedures**

If an employee discovers a chemical spill or process upset resulting in a vapor or material release, he or she will immediately notify the on-site emergency coordinator.

On-site Emergency Coordinator will obtain information pertaining to the following:

- The material spilled or released.
- Location of the release or spillage of hazardous material.
- An estimate of quantity released and the rate at which it is being released.
- The direction in which the spill, vapor or smoke release is heading.
- Any injuries involved.
- Fire and/or explosion or possibility of these events.
- The area and materials involved and the intensity of the fire or explosion.

This information will help the on-site emergency coordinator to assess the magnitude and potential seriousness of the spill or release.

**8.6.2 Procedure for Containing/Collecting Spills**

The initial response to any spill or discharge will be to protect human health and safety, and then the environment. Identification, containment, treatment, and disposal assessment will be the secondary response.

If for some reason a chemical spill is not contained within a dike or sump area, an area of isolation will be established around the spill. The size of the area will generally depend on the size of the spill and the materials involved. If the spill is large (greater than 55 gallons) and involves a tank or a pipeline rupture, an initial isolation of at least 100 ft. in all directions will be used. Small spills (less than or equal to 55 gallons) or leaks from a tank or pipe will require evacuation of at least 50 ft. in all directions to allow cleanup and repair and to prevent exposure. When any spill occurs, only those persons involved in overseeing or performing emergency operations will be allowed within the designated hazard area. If possible the area will be roped or otherwise blocked off.

If the spill results in the formation of a toxic vapor cloud (by reaction with surrounding materials or by outbreak of fire) and its release (due to high vapor pressures under ambient conditions), further evacuation will be enforced. In general an area at least 500 feet wide and 1,000 feet long will be evacuated downwind if volatile materials are spilled. (Consult the DOT Emergency Response Guide for isolation distances for listed hazardous materials.)

If an incident may threaten the health or safety of the surrounding community, the public will be informed and possibly evacuated from the area. The on-site emergency coordinator will inform the proper agencies in the event this is necessary. (Refer to Table 8.1)



## ***EMERGENCY RESPONSE AND CONTINGENCY PLAN***

As called for in regulations developed under the Comprehensive Environmental Response Compensation Liability Act of 1980 (Superfund), OHM's practice is to report a spill of a pound or more of any hazardous material for which a reportable quantity has not been established and which is listed under the Solid Waste Disposal Act, Clean Air Act, Clean Water Act, or TSCA. OHM also follows the same practice for any substances not listed in the Acts noted above but which can be classified as a hazardous waste under RCRA.

Clean up personnel will take the following measures:

- Make sure all unnecessary persons are removed from the hazard area.
- Put on protective clothing and equipment.
- If a flammable material is involved, remove all ignition sources, and use spark and explosion proof equipment for recovery of material.
- Remove all surrounding materials that could be especially reactive with materials in the waste. Determine the major components in the waste at the time of the spill.
- If wastes reach a storm sewer, try to dam the outfall by using sand, earth, sandbags, etc. If this is done, pump this material out into a temporary holding tank or drums as soon as possible.
- Place all small quantities of recovered liquid wastes (55 gallons or less) and contaminated soil into drums for incineration or removal to an approved disposal site.
- Spray the spill area with foam, if available, if volatile emissions may occur.
- Apply appropriate spill control media (e.g. clay, sand, lime, etc.) to absorb discharged liquids.
- For large spills, establish diking around leading edge of spill using booms, sand, clay or other appropriate material. If possible, use diaphragm pump to transfer discharged liquid to drums or holding tank.

### **8.6.3 Emergency Response Equipment**

The following equipment will be staged in the support zone and throughout the site, as needed, to provide for safety and first aid during emergency responses.

- ABC-type fire extinguisher
- First-aid kit, industrial size
- Eyewash/safety shower
- Emergency signal horn
- Self contained breathing apparatus (two)
- Stretcher/backboard

In addition to the equipment listed above, OHM maintains direct reading instrumentation that may be used in emergency situations to assess the degree of environmental hazard. This equipment will only be used by the Site Safety Officer or other specially trained personnel. This equipment will be stored, charged



## EMERGENCY RESPONSE AND CONTINGENCY PLAN

and ready for immediate use in evaluating hazardous chemical concentrations. The equipment will be located at the OHM office trailer.

EQUIPMENT NAME	APPLICATION
Portable H-NU Photoionization Meter	Measures selected inorganic and organic chemical concentrations
MSA Oxygen and Combustible Gas Meter	Measures oxygen and combustible gas levels
Colorimetric Detector Tubes	Assorted detector tubes to measure specific chemical concentrations

### 8.6.4 Personal Protective Equipment

A supply of two (minimum) SCBAs will be located in the support zone for use in emergency response to hazardous materials releases. They will be inspected at least monthly, according to OSHA requirements. In addition, all emergency response personnel will have respirators available for use with cartridge selection determined by the Site Safety Officer based on the results of direct reading instruments. Emergency response personnel will also be provided with protective clothing as warranted by the nature of the hazardous material and as directed by the Site Safety Officer.

### 8.6.5 Emergency Spill Response Clean-Up Materials and Equipment

A sufficient supply of appropriate emergency response clean-up and personal protective equipment will be inventoried and inspected, visually, on a weekly basis.

The materials listed below may be kept on site for spill control, depending on the types of hazardous materials present on site. The majority of this material will be located in the support zone, in a supply trailer or storage area. Small amounts will be placed on pallets and located in the active work areas.

- Sand or clay to solidify/absorb liquid spills.
- Appropriate solvents e.g. CITRIKLEEN, for decontamination of structures or equipment.

The following equipment will be kept on site and dedicated for spill cleanup:

- Plastic shovels for recovering corrosive and flammable materials.
- Sausage-shaped absorbent booms for diking liquid spills, drains, or sewers.
- Sorbent sheets (diapers) for absorbing liquid spills.
- Overpack drums for containerizing leaking drums.
- 55-gallon open-top drums for containerization of waste materials.

\*NOTE: All contaminated soils, absorbent materials, solvents and other materials resulting from the clean-up of spilled or discharged substances shall be properly stored, labeled, and disposed of off-site.

## 8.7 EMERGENCY CONTINGENCY PLAN

This section of the ERCP details the contingency measures OHM will take to prepare for and respond to fires, explosions, spills and releases of hazardous materials, hazardous weather, and medical emergencies.

## 8.8 MEDICAL EMERGENCY CONTINGENCY MEASURES

The procedures listed below will be used to respond to medical emergencies.

### 8.8.1 Response

The nearest workers will immediately assist a person who shows signs of medical distress or who is involved in an accident. The work crew supervisor will be summoned.

The work crew supervisor will immediately make radio contact with the on-site emergency coordinator to alert him of a medical emergency situation. The supervisor will advise the following information:

- Location of the victim at the work site
- Nature of the emergency
- Whether the victim is conscious
- Specific conditions contributing to the emergency, if known

The Emergency Coordinator will notify the Site Safety Officer. The following actions will then be taken depending on the severity of the incident:

- Life-Threatening Incident — If an apparent life-threatening condition exists, the crew supervisor will inform the emergency coordinator by radio, and the local Emergency Response Services (EMS) will be immediately called. An on-site person will be appointed who will meet the EMS and have him/her quickly taken to the victim.
- Non Life-Threatening Incident — If it is determined that no threat to life is present, the Site Safety Officer will direct the injured person through decontamination procedures (see below) appropriate to the nature of the illness or accident. Appropriate first aid or medical attention will then be administered.

\*NOTE: The area surrounding an accident site must not be disturbed until the scene has been cleared by the Site Safety Officer.

Any personnel requiring emergency medical attention will be evacuated from exclusion and contamination reduction zones if doing so would not endanger the life of the injured person or otherwise aggravate the injury. Personnel will not enter the area to attempt a rescue if their own lives would be threatened. The decision whether or not to decontaminate a victim prior to evacuation is based on the type and severity of the illness or injury and the nature of the contaminant. For some emergency victims, immediate decontamination may be an essential part of life-saving first aid. For others, decontamination may aggravate the injury or delay life-saving first aid. Decontamination will be performed if it does not interfere with essential treatment.

If decontamination can be performed, observe the following procedures:

- Wash external clothing and cut it away.

If decontamination cannot be performed, observe the following procedures:

- Wrap the victim in blankets or plastic to reduce contamination of other personnel.
- Alert emergency and off-site medical personnel to potential contamination, instruct them about specific decontamination procedures.
- Send site personnel familiar with the incident and chemical safety information, e.g. MSDS, with the affected person.

All injuries, no matter how small, will be reported to the SSO or the Site Supervisor. An accident/injury/illness report will be completely and properly filled out and submitted to the Regional Health and Safety Director/Project CIH, in accordance with OHM's reporting procedures.

A list of emergency telephone numbers is given in Table 8.1.

## **8.8.2 Notification**

The following personnel/agencies will be notified in the event of a medical emergency:

- Local Fire Department or EMS
- On-site Emergency Coordinator
- Workers in the affected areas
- Client Representative

## **8.9 FIRE CONTINGENCY MEASURES**

Because flammable/combustible materials are present at this site, fire is an ever-present hazard. OHM personnel and subcontractors are not trained professional firefighters. Therefore, if there is any doubt that a fire can be quickly contained and extinguished, personnel will notify the emergency coordinator by radio and vacate the structure or area. The emergency coordinator will immediately notify the local Fire Department.

The following procedures will be used to prevent the possibility of fires and resulting injuries:

- Sources of ignition will be kept away from where flammable materials are handled or stored.
- The air will be monitored for explosivity before and during hot work and periodically where flammable materials are present. Hot work permits will be required for all such work.
- "No smoking" signs will be conspicuously posted in areas where flammable materials are present.
- Fire extinguishers will be placed in all areas where a fire hazard may exist.



## ***EMERGENCY RESPONSE AND CONTINGENCY PLAN***

- Before workers begin operations in an area the foreman will give instruction on egress procedures and assembly points. Egress routes will be posted in work areas and exit points clearly marked.

### **8.9.1 Response**

The following procedures will be used in the event of a fire:

- Anyone who sees a fire will notify their supervisor who will then contact the Emergency Coordinator by radio. The emergency coordinator will activate the emergency air horns and contact the local Fire Department.
- When the emergency siren sounds, workers will disconnect electrical equipment in use (if possible) and proceed to the nearest fire exit.
- Work crews will be comprised of pairs of workers (buddy system) who join each other immediately after hearing the fire alarm and remain together throughout the emergency. Workers will assemble at a predetermined rally point for a head count.
- When a small fire has been extinguished by a worker, the emergency coordinator will be notified.

### **8.10 HAZARDOUS WEATHER CONTINGENCY MEASURES**

Operations will not be started or continued when the following hazardous weather conditions are present:

- Lightning
- Heavy Rains/Snow
- High Winds

#### **8.10.1 Response**

- Excavation/soil stock piles will be covered with plastic liner.
- All equipment will be shut down and secured to prevent damage.
- Personnel will be moved to safe refuge, initially crew trailers. The emergency coordinator will determine when it is necessary to evacuate personnel to off-site locations and will coordinate efforts with fire, police and other agencies.

#### **8.10.2 Notification**

The emergency coordinator will be responsible for assessing hazardous weather conditions and notifying personnel of specific contingency measures. Notifications will include:

- OHM employees and subcontractors
- Client Representative
- Local Emergency Management Agency

**8.11 SPILL/RELEASE CONTINGENCY MEASURES**

In the event of release or spill of a hazardous material the following measures will be taken:

**8.11.1 Response**

Any person observing a spill or release will act to remove and/or protect injured/contaminated persons from any life-threatening situation. First aid and/or decontamination procedures will be implemented as appropriate. First aid will be administered to injured/contaminated personnel. Unsuspecting persons/vehicles will be warned of the hazard. All personnel will act to prevent any unsuspecting persons from coming in contact with spilled materials by alerting other nearby persons. Attempt to stop the spill at the source, if possible. Without taking unnecessary risks, personnel will attempt to stop the spill at the source. This may involve activities such as up righting a drum, closing a valve or temporarily sealing a hole with a plug.

Utilizing radio communications, the emergency coordinator will be notified of the spill/release, including information on material spilled, quantity, personnel injuries and immediate life threatening hazards. Air monitoring will be implemented by the emergency coordinator and SSO to determine the potential impact on the surrounding community. Notification procedures will be followed to inform on-site personnel and off-site agencies. The emergency coordinator will make a rapid assessment of the spill/release and direct confinement, containment and control measures. Depending upon the nature of the spill, measures may include:

- Construction of a temporary containment berm utilizing on-site clay absorbent earth
- Digging a sump, installing a polyethylene liner and
- Diverting the spill material into the sump placing drums under the leak to collect the spilling material before it flows over the ground
- Transferring the material from its original container to another container

The emergency coordinator will notify the Client Representative of the spill and steps taken to institute clean-up. Emergency response personnel will clean-up all spills following the spill clean-up plan developed by the emergency coordinator. Supplies necessary to clean up a spill will be immediately available on-site. Such items may include, but are not limited to:

- Shovel, rake
- Clay absorbent
- Polyethylene liner
- Personal safety equipment
- Steel drums
- Pumps and miscellaneous hand tools

The major supply of material and equipment will be located in the Support Zone. Smaller supplies will kept at active work locations. The emergency coordinator will inspect the spill site to determine that the spill has been cleaned up to the satisfaction of the Client. If necessary, soil, water or air samples may be taken and analyzed to demonstrate the effectiveness of the spill clean-up effort. The emergency coordinator will determine the cause of the spill and determine remedial steps to ensure that recurrence is prevented. The emergency coordinator will review the cause with the Client Representative and obtain his concurrence with the remedial action plan.



## 9.0 TRAINING REQUIREMENTS

As a requirement for work at this site, in any hazardous waste work area, all field personnel will be required to take a 40-hour training class. This training must cover the requirements in 29 CFR 1910.120: personal protective equipment, toxicological effects of various chemicals, hazard communication, bloodborne pathogens, handling of unknown tanks and drums, confined-space entry procedures, electrical safety, etc. In addition, all personnel must receive annual 8-hour refresher training and three day on-site training under a trained, experienced supervisor. Supervisory personnel shall have received an additional 8-hour training in handling hazardous waste operations.

All personnel entering the exclusion zone will be trained in the provisions of this site safety plan and be required to sign the Health and Safety Plan Certification in Appendix A.

Site-specific training for the Albion-Sheridan Township Landfill Site, which will include potential site contaminants, Hazard Communication as per 29 CFR 1910.1200, site physical and environmental hazards, emergency response and evacuation procedures, and emergency telephone numbers and will be held at the site location by the SS and SSO before any site work activities begin.

### 9.1 SITE ORIENTATION

Outlines of the orientation for OHM / OHM sub-contract personnel and visitors are presented below:

OHM/SUBCONTRACTORS	VISITOR ORIENTATION
<ul style="list-style-type: none"><li>• HASP sign off</li><li>• Sign in/out procedures</li><li>• Site background</li><li>• Chain of command</li><li>• Rules and regulations</li><li>• Hours of work</li><li>• Absences</li><li>• Equipment</li><li>• Emergency Information<ul style="list-style-type: none"><li>• Emergency signal</li><li>• Gathering point</li><li>• Responsibilities/roles</li><li>• Emergency phone numbers</li></ul></li><li>• Contaminants and Material Safety Data Sheets (MSDS) [Hazard Communication Program]</li><li>• JSAs (Phase Safety Plans)</li><li>• Forms, site-specific</li></ul>	<ul style="list-style-type: none"><li>• Sign in/out procedures</li><li>• Review of Site map</li><li>• Work Zones in progress</li><li>• Hazard Communication</li><li>• Emergency plan/signals</li><li>• Training/medical requirements</li><li>• Zones/areas open to visitors</li></ul>

## 10.0 MEDICAL SURVEILLANCE PROGRAM

All OHM personnel participate in a medical and health monitoring program. This program is initiated when the employee starts work with a complete physical and medical history and is continued on a regular basis. A listing of OHM's worker medical profile is shown below. This program was developed in conjunction with a consultant toxicologist. Other medical consultants are retained when additional expertise is required.

(f). The medical surveillance program meets the requirements of the OSHA Standard 29 CFR 1910.120

TABLE 10.1 WORKER MEDICAL PROFILE		
Item	Initial	Annual
Medical History	X	X
Work History	X	X
Visual Acuity and Tonometry	X	X
Pulmonary Function Tests	X	X
Physical Examination	X	X
Audiometry Tests	X	X
Chest X-Ray	X	X
Complete Blood Counts	X	X
Blood Chem. (SSAC-23 or equivalent)	X	X
Urinalysis	X	X
Dermatology Examination	X	X
Electrocardiogram/Stress Test	X	X (based on age)

No specific tests are required for this project.

### 10.1 EXAMINATION SCHEDULE

Employees are examined initially upon start of employment, biannually or annually thereafter, and may be examined upon termination of employment. Unscheduled medical examinations are conducted:

- At employee request after known or suspected exposure to toxic or hazardous materials
- At the discretion of the client, the CIH, SSO, or OHM occupational physician after known or suspected exposure to toxic or hazardous materials
- At the discretion of the OHM occupational physician

A

***APPENDIX A***

***HEALTH AND SAFETY PLAN CERTIFICATION***

---

By signing this document, I am stating that I have read and understand the site health-and-safety plan for OHM Remediation Services Corp. personnel and visitors entering the Albion-Sheridan Township Landfill Site.

[illegible]



***APPENDIX B***

***OHM HAZARD COMMUNICATION PROGRAM***

---

# APPENDIX B

## OHM HAZARD COMMUNICATION PROGRAM

---

### 1. OBJECTIVE

A Site Specific Hazard Communication (Employee Right-To-Know) Program will be instituted at the Albion-Sheridan Township Landfill, Calhoun County, Michigan.

### 2. PURPOSE

The purpose of Hazard Communication (Employee Right-to-Know) is to ensure that the hazards of all chemicals located at field project sites, shops, and facilities are transmitted (communicated), according to 29 CFR 1910.1200 and 29 CFR 1926.59 to all OHM personnel and OHM subcontractors.

### 3. GENERAL REQUIREMENTS

- 3.1 It is the responsibility of site supervisors, shop supervisors, and facilities managers to ensure that the Hazard Communication Program for the area under their supervision is updated as necessary.
- 3.2 Container Labeling -- OHM personnel will ensure that all drums and containers are labeled according to contents. These drums and containers will include those from manufacturers and those produced by on site operations. All incoming and outgoing labels shall be checked for identity, hazard warning, and name and address of responsible party.
- 3.3 Material Safety Data Sheets (MSDSs) -- There will be an MSDS located on site for each hazardous chemical known to exist or which is being used on site. All MSDSs will be located in the site health and safety plan which can be found in the office trailer. MSDS's for products in use may be stored in a separate binder.
- 3.4 Employee Information and Site Specific Training -- Training employees on chemical hazards is accomplished through an ongoing corporate and regional training program. Additionally, chemical hazards will be communicated to employees through daily safety meetings held at the project and by an initial site orientation program.
- 3.5 OHM employees will be instructed on the following:
  - Chemicals and their hazards in the work area
  - How to prevent exposure to these hazardous chemicals
  - What the company has done to prevent workers' exposure to these chemicals
  - Procedures to follow if they are exposed to these chemicals
  - How to read and interpret labels and MSDSs for hazardous substances
  - Emergency spill procedures
  - Proper storage and labeling
- 3.6 Before any new hazardous chemical is introduced on site, each employee will be given information in the same manner as during the initial safety class. The site supervisor will be responsible for seeing that the MSDS on the new chemical is available. During the mandatory morning safety briefing, information on each new chemical will be presented.

Should any new chemical be brought on site, the appropriate MSDSs will be added and reviewed with the employees.



## ***OHM HAZARD COMMUNICATION PROGRAM***

### **1. GENERAL**

The following written Hazard Communication Program has been established for OHM Remediation Services Corp. (OHM). The purpose of this program is to transmit information to the workers about the chemical hazards in the work place using various media. The transmittal of information will be accomplished by means of a comprehensive Hazard Communication Program, which will include container labeling and other forms of warning, material safety data sheets (MSDSs), and employee training in accordance with 29 CFR 1910.1200 and 29 CFR 1926.59.

Upon mobilization at the job site the Hazard Communication Program will be reviewed with all employees. Upon reading the Hazard Communication Program employees will be asked to sign the "Worker Hazard Communication Acknowledgment Form". The Hazard Communication Program will also be reviewed with new employees and visitors as they arrive on site. These persons will also be asked to sign the acknowledgment form. The Hazard Communication Program shall be available for review by anyone on site any time during normal work hours. OHM will accomplish the hazard communication requirements through formal safety training, departmental safety meetings, and job-site safety meetings.

The Health and Safety Department shall update the Hazard Communication Program when personnel responsibilities change, a new non-routine task is introduced, or an extremely hazardous material needs particular attention. This new program will then be distributed throughout the company.

### **2. RESPONSIBILITIES**

Overall responsibility for compliance with the Site Specific Hazard Communication Program Site Supervisor and SSO of OHM. A brief outline of responsibilities for those persons directly involved with the program will follow. These responsibilities are not all inclusive, but are designed to give guidance in initial and long-term program development. Since each area is different, these responsibilities may vary.

This program is intended to cover those employees who are directly involved with the handling of hazardous chemicals or supervision of activities that involve the use of hazardous chemicals.

#### **2.1 Health and Safety Department Responsibilities**

- Review operations with site supervisors to determine what tasks require hazard communication training.
- Advise supervisory people as to which materials may need to be considered hazardous initially and eventually to ensure that hazard task determination is being done according to the written policy.
- Follow up through safety meetings and safety audits to ensure that supervisors are carrying out prescribed company policy.
- Notify supervisors immediately of any operating changes affecting the hazardous chemicals being used.

#### **2.2 Training Department Responsibilities**

- Ensure that up-to-date records are maintained on training of all employees required to handle hazardous chemicals. The supervisor should keep copies of these records and should also send copies of the initial training to the corporate training secretary for the training file.
- Educate personnel upon initial 40-hour OSHA training to the requirements of the Hazard Communication Standard.

### 2.3 Site Supervisors' Responsibilities

- Identify jobs requiring the use of hazardous chemicals and develop a list of those jobs and chemicals.
- Provide the training required by the Hazard Communication Standard and document training of employees in the safe handling of hazardous chemicals.
- Ensure inspection of engineering controls and personal protective equipment before each use. The health and safety department shall help determine a suitable inspection plan for each application as needed.
- Make daily surveys of the work area to ensure that safe practices are being followed. Advise employees of and document unsafe work practices on the first occasion and consider further unsafe work practices as disciplinary violations. Use documentation as topics of safety meetings.
- Ensure required labeling practices are being followed. Labels should be affixed to the container when it arrives. If the contents are transferred to another container, then all label information (manufacturer, manufacturer's telephone number, product name, target organ(s) and product number) must also be affixed to the new container, so that all containers of the material, regardless of size, are labeled. Contact the health and safety department for proper labels.
- Enforce all applicable safety and health standards through periodic documented audits.
- Before ordering a material, determine if a MSDS exists on file. Request a MSDS from the manufacturer for all new products.

### 2.4 Employee Responsibilities

- Read and understand entire Site Specific Hazard Communication Program.
- Obey established safety rules and regulations.
- Use all safety procedures and personal protective equipment as required by company procedures.
- Notify supervisor of the following:
  - Any symptoms or unusual effects that may be related to the use of hazardous chemicals.
  - Any missing, incomplete, or unreadable labels on containers.
  - Missing, damaged, or malfunctioning safety equipment.
- Use approved labels on containers; do not remove labels (labels are available from the health and safety department).
- Use only approved containers for hazardous chemicals. (Is chemical and container compatible and appropriate?)
- Know where emergency equipment and first-aid supplies are located.
- Know location of MSDSs. These will be located in the break/decon area and the job-site office trailer.
- Know what you are expected to do in case of an emergency. Before the commencement of any task, emergency considerations shall be made.

## 2.5 Shipping/Receiving Personnel Responsibilities

- The Project Accountant (PA) or other persons assigned by the site supervisor shall ensure MSDSs are received with initial shipment of a hazardous chemical; if not, contact purchasing to request the appropriate MSDS and also call the health and safety department to determine if there is a MSDS available until the requested MSDS arrives.
- Ensure labels with required information are affixed to all containers.
- Store hazardous materials in designated locations.
- Use proper personal protective equipment when handling hazardous chemicals.
- Report damaged containers or spills to the site supervisor and the site safety officer immediately.

## 3. HAZARD DETERMINATION

OHM will rely on MSDSs from chemical suppliers and manufacturers to meet hazard determination requirements. Other relevant data from laboratory analyses, chemical reference materials, and chemical manufacturers' written evaluation procedures will be utilized when warranted. No other method shall be used to determine a chemicals' hazards unless approved by the health and safety department.

## 4. LABELING

The site supervisor will be responsible for seeing that all containers arriving at OHM job sites are properly and clearly labeled. Site supervisors shall also check all labels for chemical identity and appropriate hazard warnings. If the hazardous chemical is regulated by OSHA in a substance specific health standard (29 CFR 1910), the site supervisor shall ensure that the labels or other forms of warning used are in accordance with the requirements of that standard. Any container that is not labeled shall be immediately labeled after initial discovery with the required information.

The site supervisor or Team Leader shall be responsible for seeing that all portable containers used in their work area are properly labeled with chemical identity and hazard warning. (Refer to MSDS for required labeling information.)

The site supervisor or Team Leader shall also ensure that labels on hazardous chemical containers are not removed or defaced unless the container is immediately marked with the required information and that all labels are legible in English and prominently displayed on the container or readily available in the work area throughout each shift.

If any container is found and the contents cannot be identified, the site supervisor shall be contacted immediately. When proper identification is made, a label shall be affixed to the container immediately. If it is discovered that no MSDS is available, the manufacturer and the health and safety department shall be contacted to assist in locating the proper MSDS. If there is no means of identifying the material in the container, the container shall be taken out of service, away from all personnel until it can be tested by the health and safety department or laboratory personnel. The site supervisor shall communicate their findings or awareness of such containers to all personnel working in the area and to the district health and safety manager.

## 5. MATERIAL SAFETY DATA SHEETS (MSDS)

The site supervisor at OHM job sites will be responsible for maintaining a current MSDS relevant to the hazardous chemicals used on their job sites. The health and safety department will be responsible for compiling



## ***OHM HAZARD COMMUNICATION PROGRAM***

the initial MSDS file for the job site and aiding all job sites with the completion and maintenance of their respective MSDS files.

All MSDSs shall be readily available for review by all employees during each work shift. Each job site will designate a clearly marked "Employee Right-to-Know" station where employees can immediately obtain a MSDS and the required information in an emergency. MSDSs shall also be made available, upon request, to designated OHM representatives, other employer's employees, and to any OSHA inspector in accordance with the requirements of 29 CFR 1910.1200(e).

Although manufacturers are required to provide employers with MSDSs on an initial chemical shipment, OHM purchasing agents (and site supervisors purchasing their own material) shall request MSDSs and updates to MSDSs on all purchase orders. Site supervisors that are without proper MSDSs shall be responsible for requesting this information from chemical manufacturers. The site supervisor shall maintain a file of follow-up letters for all hazardous chemical shipments they receive without MSDSs.

### **6. EMPLOYEE INFORMATION AND TRAINING**

It is the responsibility of the supervisor in charge of each employee to ensure that the employee is properly trained. Training employees on chemical hazards and chemical handling is accomplished at the time of initial employment at OHM, whenever a new chemical (or physical) hazard is introduced into the work area, and through ongoing formal and informal training programs. Additionally, chemical hazards are communicated to employees through weekly and morning, job-site safety meetings, which shall be documented according to topic, major points discussed, and names of those attending (attendance is mandatory). Records of all formal training conducted at OHM are coordinated and maintained by the Training Department secretary.

At a minimum, OHM will inform employees on the following:

- The requirements of 29 CFR 1910.1200--Hazard Communication--Evaluating the potential hazards of chemicals and communicating information concerning hazards and appropriate protective measures to employees. OHM shall accomplish employee training in several different ways including, but not limited, to 40-hour OSHA Hazardous Waste Worker Training (29 CFR 1910.120), shop safety meetings, job-site safety meetings, Health and Safety Department safety meetings, and formal and informal training about specific chemical hazards.
- The location and availability of the written Hazard Communication Program, list of hazardous chemicals, and MSDSs will be periodically posted on the employee bulletin boards providing the location of the above material.
- Any operations in their work area where hazardous chemicals are present.
- How to work safely with chemicals present in the workplace and minimize potential exposure.

Employee training shall include the following:

- Methods and observations that may be used to detect the presence or release of a hazardous chemical in the work area (monitoring instruments, visual appearance or odor, and acute and chronic health effects).
- The physical, chemical, and health hazards of the chemicals in the work area.
- The methods of preventing exposure to hazardous chemicals including the measures OHM has taken to protect the employees.



## ***OHM HAZARD COMMUNICATION PROGRAM***

- Procedures to follow if OHM employees are exposed to hazardous chemicals (location of the nearest phone, emergency eyewash, and shower will be included). These discussions shall include proper operating procedures for all emergency equipment.
- The details of the OHM written Hazard Communication Program, including an explanation of the labeling system and the MSDSs, and how employees can obtain and use the appropriate hazard information.
- Procedures for workers involved in non-routine tasks.

Each site supervisor shall ensure that the above training is emphasized to OHM employees. The health and safety department will ensure that each job site is properly informing and training all employees through group meetings and individual discussions. Whenever a new hazardous chemical is placed into use, the site supervisor shall inform the employees of the hazards said chemical may pose. The site supervisor shall also be responsible for obtaining and making available a MSDS for the new chemical.

### **7. HAZARDOUS NON-ROUTINE TASKS**

Occasionally, employees at OHM are required to perform tasks which are considered to be non-routine. All tasks OHM considers non-routine shall be carefully discussed among the supervisor and those performing the task. This safety briefing shall include all possible hazards an employee may encounter while completing the task, including:

- Hazard recognition
- Chemicals involved and their hazardous properties
- Physical hazards
- Methods of avoiding hazards (monitoring instruments, proper personal protective equipment, etc.)

The following is a list of some of the non-routine tasks which may occur at OHM job sites. These tasks are all covered in detail in various OHM standard operating Procedures.

- 7.1 Confined Space Entry
- 7.2 Excavation, Trenching, and Shoring
- 7.3 Decontamination of Equipment
- 7.4 Laboratory Spills
- 7.5 High-Pressure Washer (Laser) Operation
- 7.6 Line Entry Procedure
- 7.7 Hot Work

### **8. INFORMING CONTRACTORS**

It shall be the responsibility of the OHM site supervisor/SSO to provide subcontractors with the following information:

- Hazardous chemicals to which they may be exposed while performing a task including the following:
  - Chemical properties
  - Physical properties
  - Acute/Chronic health effects
- Location of "Employee Right-to Know" station which includes the following:
  - MSDS for work area
  - Hazard Communication Program

# ***OHM HAZARD COMMUNICATION PROGRAM***

- Other relevant safety material such as Project Health and Safety Plan (HASP)
- Precautionary measures to be taken to protect employees from chemical and physical hazards.
- Location of nearest emergency equipment (fire extinguisher, eyewash, shower, phone, first-aid kit, etc.)
- Procedures to follow in the event of employee exposure.
- Steps OHM has taken to reduce the risk of exposure to physical and chemical hazards including the following:
  - Safety meetings
  - Hazard Communication Program
  - Proper storage and labeling of hazardous chemicals
  - Health and safety department shop audits
- The methods used to label all hazardous chemicals.
- Emergency evacuation signals and evacuation rally locations.

The health and safety department shall offer assistance in providing the above information to subcontractors working at OHM job sites. On initial visit by a subcontractor to OHM job sites, a "Contractor Right-to-Know" release form shall be completed. This form will state that the above information has been communicated to the perspective contractor.

Conversely, the site supervisor shall obtain the above information from subcontractors for hazardous materials they have brought to our projects.

## **8.1 Contractor Right-to-Know Acknowledgment**

By signing this sheet, the signee is stating that an OHM employee or representative has briefed said signee on the essentials of OHM's Hazard Communication Program, including hazardous chemical(s) to which one may be exposed, location of program and MSDS, precautionary measures taken to protect contractors from chemical and physical hazards, location of nearest emergency equipment, procedures to follow in the event of employer's employee chemical exposure, and method used to label all hazardous chemicals.

Name	Date	Company
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____
_____	_____	_____

## **9. LIST OF HAZARDOUS CHEMICALS**

The following is a list of hazardous chemicals used on this OHM job site. Further information on each hazardous chemical listed below can be found in the MSDS which are included in the site specific health and safety plan.



## OHM HAZARD COMMUNICATION PROGRAM

- Typical OHM Job-Site Hazardous Chemical Inventory List

Available  
On Site

Chemicals

_____	Acetone
_____	Acetylene
_____	Activated Charcoal, Powder
_____	Alum (Aluminum Sulfate)
_____	Anti-fog Bausch & Lomb
_____	Argon/Methan (95%/5%)
_____	Brake Fluid
_____	Calcium Hydroxide (Hydrated Lime)
_____	Calibration Check Gas
_____	Carbon
_____	Caustic Soda (Sodium Hydroxide)
_____	Citrikleen
_____	Coal Fly Ash
_____	Compressed Air
_____	Diatomaceous Earth
_____	Diesel Fuel
_____	Dry Ice (Solid Carbon Dioxide)
_____	Ethylene Glycol
_____	Ferric Chloride
_____	Freon
_____	Gear Grease - Delta
_____	Helium
_____	Hexane
_____	Hydraulic Fluid
_____	Hydrochloric Acid
_____	Hydrogen
_____	Isobutylene
_____	Kiln Dust
_____	Methanol
_____	Nitrogen
_____	Nitrous Oxide
_____	Oxygen
_____	Penetone
_____	Pentane
_____	Polymers (Flocculants)
_____	Premium Unleaded Gasoline
_____	PVC Solvent Cleaner
_____	PVC Cement
_____	Regular Leaded Gasoline
_____	Starting Fluid
_____	Stoddard Solvent
_____	Sulfuric Acid
_____	10W-40 Motor Oil - Shell
_____	Tube Grease - Kendall
_____	TU Type 555 Thread Sealing Compound
_____	2-Cycle Oil - Wolf's Head



- [illegible]



C

***APPENDIX C***  
***MATERIAL SAFETY DATA SHEETS***

---

# Material Safety Data Sheet

May be used to comply with  
 OSHA's Hazard Communication Standard,  
 29 CFR 1910.1200. Standard must be  
 consulted for specific requirements.

## U.S. Department of Labor

Occupational Safety and Health Administration

(Non-Mandatory Form)

Form Approved

OMB No. 1218-0072



IDENTITY (As Used on Label and List)

Coal Fly Ash Class F, Class C

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

### Section I

Manufacturer's Name

American Fly Ash Company

Emergency Telephone Number

312/297-8811

Address (Number, Street, City, State, and ZIP Code)  
 606 Potter Road

Telephone Number for Information

312/297-8811

Des Plaines, IL 60016

Date Prepared

December 22, 1987

Signature of Preparer (optional)

### Section II -- Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	mg/m <sup>3</sup> ACGIH TLV	Other Limits Recommended	Range % (optional)
Consists primarily of the following:				
Silica (SiO <sub>2</sub> )				42-59
Alumina (Al <sub>2</sub> O <sub>3</sub> )		10		16-29
Iron Oxide (Fe <sub>2</sub> O <sub>3</sub> )		5		6-24
Calcium Oxide (CaO)		2		1-16
Magnesium Oxide (MgO)		10		1-5
Potassium Oxide (K <sub>2</sub> O)				1-3

Coal fly ash is chemically inorganic, composed of primarily silica, iron, alumina oxides. Class F bituminous fly ash is primarily aluminosilicate glass. Class C sub-bituminous fly ash is primarily calcium aluminosilicate glass.

\* TLV's are given for total dust

\*\* TLV is for total dust containing 20% quartz; TLV for respirable dust containing 20% quartz is 0.5 mg/m<sup>3</sup>

### Section III -- Physical/Chemical Characteristics

Boiling Point	N/A	Specific Gravity (H <sub>2</sub> O = 1)	2.2-2.9
Vapor Pressure (mm Hg.)	N/A	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	N/A

Solubility in Water

≈ 5% less for a Class F.

Appearance and Odor

Hygroscopic light gray to buff colored powder

### Section IV -- Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
N/A (closed cup) N/A (open cup)	N/A	N/A	N/A
Extinguishing Media			
N/A			
Special Fire Fighting Procedures			
N/A - Hazardous polymerization will not occur.			

Unusual Fire and Explosion Hazards

N/A - products formed by fire or excessive heat CO<sub>2</sub>, H<sub>2</sub>O, SO<sub>2</sub>

## Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid
	Stable	X	

Incompatibility (Materials to Avoid)  
**Powerful oxidizers:** flourine, chloride trifluoride, manganese trioxide, etc.

Hazardous Decomposition or Byproducts

None.

Hazardous Polymerization	May Occur		Conditions to Avoid
	Will Not Occur	X	

## Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? **Yes** Skin? **Yes - (contact)** Ingestion? **Yes**

Health Hazards (Acute and Chronic)

**Particles may irritate eyes, skin and mucous membranes of the respiratory tract.**

Carcinogenicity: **NTP?** IARC Monographs? **CDHA Required?**

Signs and Symptoms of Exposure

**Coughing, sore throat, irritated eyes.**

Medical Conditions

Generally Aggravated by Exposure

**Repeated over-exposure may result in respiratory tract irritation.**

Emergency and First Aid Procedures

**Eye contact - Flush thoroughly with water** Skin contact - wash with soap & water.

**Inhalation - Remove to fresh air** Material is not orally toxic.

## Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material is Released or Spilled

**Collect and dispose of spilled material using normal care to avoid excessive nuisance dust.**

Waste Disposal Method

**Dispose of waste materials as an inert solid in a landfill following all applicable Federal, State and local regulations.**

Precautions to Be Taken in Handling and Storing

**Store fly ash in dry containers in dry area; handle fly ash as you would any finely divided dust.**

Other Precautions

## Section VIII — Control Measures

Respiratory Protection (Specify Type)

**Protective dust filter mask, such as 3M's "non-toxic particle mask #850"**

Ventilation	Local Exhaust	local ventilation of dust source where possible.	Special	equivalent.
	Mechanical (General)	general exhaust system capable of maintaining levels at or below exposure limit.	Other	

Protective Gloves

**not needed unless dry sensitive skin is a problem.**

Eye Protection

**Wear goggles in high dust area.**

DISCLAIMER: Safety and health information provided is believed to be accurate. It is offered as a convenience only for use in recipient's own independent verification and/or investigation and not reliance thereon, otherwise. American Fly Ash Co. DISCLAIMS any express and implied warranties, including accuracy, adequacy, and suitability of the information. It is intended for persons of appropriate knowledge.



## Genium Publishing Corp.

One Genium Plaza  
Schenectady, NY 12304-4690  
(518) 377-8854

## Material Safety Data Sheet Collection

Lead Monoxide

MSDS No. 38

Date of Preparation: 11/79

Revision: B, 6/94

### Section 1 - Chemical Product and Company Identification

44

**Product/Chemical Name:** Lead Monoxide

**Chemical Formula:** PbO

**CAS No.:** 1317-36-8

**Synonyms:** lead (II) oxide; lead oxide, yellow; lead protoxide; litharge; massicot; plumbous oxide

**Derivation:** An oxide of lead made by controlled heating of metallic lead; various forms of lead and various temperatures from 932-1832 °F (500-1000 °C) are used.

**General Use:** Used in ointments, plasters, varnishes; preparing solution of lead subacetate; glazing pottery; glass flux for painting on porcelain and glass; with glycerol as metal cement; as a heat stabilizer for plastics; to produce iridescent colors on brass and bronze; in coloring sulfur-containing substances, e.g. hair, nails, wool, horn; in manufacturing of storage battery plates, paints, ink, acid-resisting compositions, match-head compositions, and artificial tortoise shell and horn; as a pigment for rubber; in manufacturing boiled linseed oil; in assay of gold and silver ores.

**Vendors:** Consult the latest *Chemical Week Buyers' Guide*. (73)

### Section 2 - Composition / Information on Ingredients

Lead Monoxide, ca 100 %wt; 92.8% Pb, 7.17% O

The following exposure limits are for lead elemental and inorganic compounds, as Pb:

#### OSHA PELs

8-hr TWA: 0.05 mg/m<sup>3</sup>

29 CFR 1910.1025

#### ACGIH TLVs

TWA: 0.15 mg/m<sup>3</sup>

*Notice of Intended Change:*

0.05 mg/m<sup>3</sup>

#### NIOSH REL

10-hr TWA: <0.1 mg/m<sup>3</sup>

IDLH: 700 mg/m<sup>3</sup>

#### DFG (Germany) MAK\*

TWA: 0.1 mg/m<sup>3</sup>, total dust

Category III: Substances with systemic effects, onset of effect > 2 hr, half-life > shift length (strongly cumulative)

Peak Exposure Limit: 1 mg/m<sup>3</sup>, 30 min, average value, 1 per shift

Group B: According to currently available information, a risk of damage to the developing embryo or fetus must be considered to be probable. Damage to the developing organism cannot be excluded when pregnant women are exposed even when MAK and BAT values are adhered to.

### Section 3 - Hazards Identification

#### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Lead monoxide exists in two forms as red to reddish-yellow or yellow crystals. Lead poisoning is the primary health hazard. Occupational lead poisoning is due to inhalation of dust and fumes. Major affected organs are the nervous, blood, renal (kidneys), and reproductive systems. Health impairment or disease may result from a severe acute short-term or chronic exposure. Occupational exposure to lead monoxide dust can occur during its production and use as well as from smelting, refining, and other operations in which metallic lead is heated in the presence of air such as metal cutting, welding, and burning off lead paint.

#### Potential Health Effects

**Primary Entry Routes:** Inhalation, ingestion.

**Target Organs:** Blood, central and peripheral nervous systems, kidneys, and gastrointestinal tract.

#### Acute Effects

**Inhalation:** Inhalation is the most important way lead enters the body. An acute, short-term dose of lead may cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are rare. Reversible kidney damage can occur from acute exposure, as well as anemia. Dust inhalation may also cause mucous membrane and upper respiratory tract irritation.

**Eyes:** Irritation.

**Skin:** Irritation.

**Carcinogenicity:** IARC, NTP, and OSHA do not list lead monoxide as a carcinogen. The IARC and EPA list lead elemental and inorganic compounds as Pb as (IARC-2B) possibly carcinogenic to humans: limited evidence in humans in the absence of sufficient evidence in experimental animals and (EPA-B2) probable human carcinogen: sufficient evidence from animal studies, inadequate evidence or no data from epidemiological studies.

**Medical Conditions Aggravated by Long-Term Exposure:** Lead may aggravate nervous system disorders (e.g., epilepsy, neuropathies), kidney diseases, high blood pressure (hypertension), infertility, and anemia. Lead-induced anemia and its effect on blood pressure can aggravate cardiovascular disease.

**Wilson  
Risk  
Scale**  
R 1  
I 4  
S 1  
K 1

**HMIS**  
H 3\*  
F 0  
R 0

\*Chronic  
effects  
PPE †  
†Sec. 8

**Chronic Effects:** Symptoms of chronic long-term overexposure include appetite loss, nausea, metallic taste in the mouth, lead line on gingival (gum) tissue, constipation, anxiety, anemia, pallor of the face and the eye grounds (the part of the eye opposite the pupil, i.e. the retina), excessive tiredness, weakness, insomnia, headache, nervous irritability, fine tremors, numbness, muscle and joint pain, and colic accompanied by severe abdominal pain. Paralysis of wrist and less often, ankle extensor muscles may occur after years of increased lead absorption. Kidney disease may also result from chronic overexposure, but few, if any, symptoms appear until severe kidney damage has occurred. Reproductive damage is characterized by decreased sex drive, impotence, and sterility in men; and decreased fertility, abnormal menstrual cycles, and miscarriages in women. Unborn children may suffer neurological damage or developmental problems due to excessive lead exposure in women who are or may become pregnant. Lead poisoning's severest result is encephalopathy manifested by severe headache, convulsions, coma, delirium, and possibly death.

**Comments:** Lead concentrates and remains in bone tissue for many years. The amount of lead the body stores increases as exposure continues, with possibly cumulative effects. Depending on the dose entering the body, lead can be deadly within several days or affect health after many years. Certain conditions such as aging, pregnancy, or menopause may cause release of stored lead. Lead may also be released if a worker who has had considerable lead exposure is immobilized sufficiently (as with a broken leg) to allow mineral loss from the bones.

### Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 min. Consult an ophthalmologist if irritation or pain persist.

**Skin Contact:** *Quickly* remove contaminated clothing. Flush with water to remove solid particles; wash exposed areas with soap and water. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Note to Physicians:** For diagnosis, obtain blood pressure, blood lead level (PbB), zinc protoporphyrin (ZPP), complete blood count for microcytic anemia and basophilic stippling, urinalysis, and blood urea nitrogen (BUN) of creatinine. Examine peripheral motor neuropathy, pallor, and gingival lead line. For acute intoxication, use chelating agents like  $\text{CaNa}_2\text{EDTA}$  (edetate calcium disodium, Versenate), but *never* use chelates prophylactically as severe side effects may occur. Consult an occupational physician or toxicologist.

**Special Precautions/Procedures:** Emergency personnel should protect against contact.

### Section 5 - Fire-Fighting Measures

**Flash Point:** Not flammable

**Autoignition Temperature:** None reported.

**LEL:** None reported.

**UEL:** None reported.

**Extinguishing Media:** For small fires, use dry chemical,  $\text{CO}_2$ , water spray or standard foam. For large fires, use water spray, fog or standard foam.

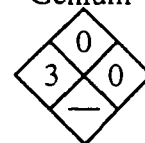
**Unusual Fire or Explosion Hazards:** None reported.

**Hazardous Combustion Products:** Highly toxic, lead fume.

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways.

**Fire-Fighting Equipment:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing will provide limited protection.

Genium



### Section 6 - Accidental Release Measures

**Spill /Leak Procedures:** Notify safety personnel of large spills, evacuate all unnecessary personnel, and provide adequate ventilation. Cleanup personnel should protect against dust inhalation.

**Small Spills:** For dry spills, place material into a clean, dry container with a clean shovel. For liquid spills, take up with sand or other noncombustible absorbent material and place into containers for later disposal. Move containers from spill area.

#### Large Spills

**Containment:** For large spills, dike far ahead of liquid spill for later disposal. Do not release into sewers or waterways.

**Cleanup:** Avoid generating dusty conditions. *Do not* sweep! To minimize dust, use a vacuum or wet mop.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

### Section 7 - Handling and Storage

**Handling Precautions:** Avoid breathing dust. Lead monoxide is dangerous when heated because it emits highly toxic lead fume. Practice good personal hygiene; wash and change clothes after contamination with lead compounds.

**Storage Requirements:** Store in a cool, well-ventilated area away from areas of high fire hazard and incompatibles (Sec. 10).

## Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Enclose all processes to minimize dust dispersion into work areas.

**Ventilation:** Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source. <sup>(103)</sup>

**Administrative Controls:** Consider preplacement and periodic medical exams with emphasis on the teeth, gums, and hematologic, gastrointestinal, renal, cardiovascular, neurological, and pulmonary systems. Measurement of blood lead level (PbB) and zinc protoporphyrin (ZPP) are useful indicators of the body's lead absorption level. As per the *Notice of Intent to Establish BEIs for 1994-1995*, ACGIH recommends a BEI of 30 µg/100 mL for lead in blood.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. The following respirator requirements are for lead (as Pb). For concentrations ≤ 0.5 mg/m<sup>3</sup>, wear any supplied-air respirator with high-efficiency particulate filter or a SCBA. For concentrations ≤ 1.25 mg/m<sup>3</sup>, wear any powered, air-purifying respirator with a high-efficiency particulate filter or any supplied-air respirator operated in a continuous-flow mode. For concentrations ≤ 2.5 mg/m<sup>3</sup>, wear any air-purifying, full-facepiece respirator with a high-efficiency particulate filter; or any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter, or any SCBA with a full facepiece, or any supplied-air respirator operated in a continuous-flow mode, or any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode. For concentrations ≤ 50 mg/m<sup>3</sup>, wear any supplied-air respirator operated in a pressure-demand or other positive-pressure mode. For concentrations ≤ 100 mg/m<sup>3</sup>, wear any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.** If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. *Do not* wear cotton overalls as they retain more dust than other materials. Also avoid cuffs, pleats, and pockets in which lead dust may collect. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

**Contaminated Equipment:** Change protective clothing at least daily at the end of each work shift or more frequently if it becomes grossly contaminated. Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment.

**Comments:** Never eat, drink, or smoke in work areas. *Do not* store cigarettes or food in work areas where they may become contaminated. Practice good personal hygiene after using lead monoxide, especially before eating, drinking, smoking, using the toilet, or applying cosmetics. Wash daily at the end of each work shift.

## Section 9 - Physical and Chemical Properties

**Physical State:** Solid

**Appearance and Odor:** Exists in two forms: red to reddish-yellow, tetragonal crystals (litharge) and yellow, orthorhombic crystals (massicot).

**Vapor Pressure:** 10 mm Hg at 1985 °F (1085 °C)

**Formula Weight:** 223.21

**Density (H<sub>2</sub>O=1, at 4 °C):** 9.53 (litharge); 8.0 (massicot)

**Melting Point:** 1630 °F (888 °C)

**Water Solubility:** 0.001 g/100 cc at 68 °F (20 °C) (litharge); 0.0023 g/100 cc at 75 °F (23 °C) (massicot)

**Other Solubilities:** ammonium chloride, acetic acid, dilute nitric acid, in warm solutions of fixed alkali hydroxide; insoluble in alcohol

**pH:** strong base

**Refractive Index:** 2.51 (massicot)

## Section 10 - Stability and Reactivity

**Stability:** Lead monoxide is stable at room temperature in closed containers under normal storage and handling conditions.

Litharge is stable at ordinary temperatures and massicot is stable above 912 °F (489 °C).

**Polymerization:** Hazardous polymerization cannot occur.

**Chemical Incompatibilities:** Chlorine, perchloric acid, metals, non-metals, metal acetylides, strong oxidizers, hydrogen peroxide, and violent or explosive reactions occur when heated with aluminum powder, chlorinated rubber [above 392 °F (200 °C)], peroxyformic acid, fluoroelastomers (at 200 °C), rubidium acetylide (at 200 °C), silicon + aluminum + heat, zirconium + heat, chlorine + ethylene [at 212 °F (100 °C)], perchloric acid + glycerol, hydrogen trisulfide, linseed oil, fluorine + glycerol, dichloromethylsilane, and silicon + heat. Mixtures of lead oxide with glycerol as a jointing compound may explode when exposed to powerful oxidizers. Incandescent reactions occur with boron, warm aluminum carbide, lithium acetylide, sulfur trioxide, and seleninyl chloride.

**Conditions to Avoid:** Incompatibles and heat and ignition sources.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of lead monoxide can produce highly toxic lead fume.

## Section 11- Toxicological Information

### Toxicity Data:\*

#### Skin Effects:

Rabbit: 100 mg/24 hr caused mild irritation.

#### Genetic Effects:

Hamster embryo: 50 µmol/L caused oncogenic transformation.

#### Acute Oral Effects:

Dog, oral, LD<sub>50</sub>: 1400 mg/kg

\* See NIOSH, RTECS (OG1750000), for additional toxicity data for lead monoxide. Also consult NIOSH RTECS (OF7525000) for additional toxicity data for lead.

## Section 12 - Ecological Information

**Aquatic toxicity:** >56,000 ppm/96 hr/mosquito fish/TLM/turbid water

**Environmental Transport:** Aquatic biota, both invertebrate and vertebrate, have been shown to bioconcentrate lead at levels greater than in water, and sometimes similar to those in sediments.

**Environmental Degradation:** Lead monoxide is released to the atmosphere in particulate matter and is subject to washout and gravitational settling. Transformations to the carbonate are expected. If released into water, lead monoxide will partly settle out due to its fairly low solubility and partially dissolve. In the dissolved state it will form ligands, the dominant ones varying with pH. The amount of lead that can remain in solution in water is a function of the pH of the water and the dissolved salt content. Much of the lead carried by river water is in the form of suspended solids. Volatilization of lead monoxide from soil or water will be negligible due to its low vapor pressure and relative insolubility.

**Soil Absorption/Mobility:** Lead in soil is relatively immobile and can persist for long periods of time. Lead monoxide will not leach in soil because of its relative insolubility. The soil's capacity to remove lead from solution is correlated with the soil pH, cation exchange capacity, organic matter and the available phosphorus level.

## Section 13 - Disposal Considerations

**Disposal:** Dissolve in nitric acid, precipitate as the sulfide, and return to the supplier for reprocessing. Contact your supplier or a licensed contractor for detailed recommendations. For a water spill, neutralize with agricultural lime, crushed limestone, or sodium bicarbonate. Adjust pH to neutral and use mechanical dredges or lifts to remove immobilized masses of pollutants and precipitates. Follow applicable Federal, state, and local regulations.

## Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101): Not listed

## Section 15 - Regulatory Information

### EPA Regulations:

Classified as a RCRA Hazardous Waste (as lead) (40 CFR 261.24), Characteristic of Toxicity, Hazardous Waste No. D008, Regulatory Level: 5.0 mg/L

Listed as a CERCLA Hazardous Substance (as lead and compounds) (40 CFR 302.4) per CWA, Sec. 307(a)

CERCLA Reportable Quantity (RQ): No RQ is being assigned to the generic or broad class; Statutory RQ is 1 lb (0.454 kg)

Listed as a SARA Toxic Chemical (as lead compounds) (40 CFR 372.65)

SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed

### OSHA Regulations:

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)

Listed as an OSHA Specifically Regulated Substance (as lead) (29CFR 1910.1025)

## Section 16 - Other Information

**References:** 73, 103, 124, 132, 136, 140, 148, 149, 159, 167, 168, 176, 184, 186, 187, 189, 192

**Prepared By** ..... MJ Wurth, BS

**Industrial Hygiene Review** ..... PA Roy, MPH, CIH

**Medical Review** ..... T Thoburn, MD, MPH

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.





# Genium Publishing Corporation

1145 Catalyn Street  
Schenectady, NY 12303-1836 USA  
(518) 377-8854

## Material Safety Data Sheets Collection:

Sheet No. 59  
Beryllium Metal/Powder

Issued: 4/80

Revision: A, 11/89

30

### Section 1. Material Identification

**Beryllium Metal/Powder Description:** A naturally occurring ore found in chrysoberyl ( $\text{Be}_2\text{SiO}_5$ ) or produced industrially from beryl ( $3\text{Be}_2\text{O}_3 \cdot 6\text{SiO}_2$ ). The ore is converted to the oxide or hydroxide, then to the fluoride or chloride. The halide may be reduced in a furnace by magnesium metal or by electrolysis. An alternative purification process is a liquid-liquid extraction with an organophosphate chelating agent. Used in aerospace structures, radio tube parts, inertial guidance systems, computer parts, Be-Cu alloys, gyroscopes; used as an additive in solid propellant rocket fuels, as a neutron source when bombarded with alpha particles, and as a neutron moderator and reflector in nuclear reactors.

**Other Designations:** Glucinium; Be; CAS No. 7440-41-7.

**Manufacturer:** Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.

R	1	<div>Genium</div> <div><div>1</div><div>4</div><div>0</div><div>-</div></div> <div>HMIS</div> <div>H 4</div> <div>F 1</div> <div>R 0</div> <div>PPG*</div> <div>* Sec. 8</div>
I	4	
S	2	
K	1	

### Section 2. Ingredients and Occupational Exposure Limits

Beryllium and compounds, ca 100%

#### OSHA PELs

8-hr TWA: 0.002 ppm

30-min STEL: 0.005 ppm

Ceiling level: 0.025 ppm

#### ACGIH TLV, 1989-90\*

TLV-TWA: 0.002 mg/m<sup>3</sup>

NIOSH REL, 1987\*

Not to exceed 0.5 µg/m<sup>3</sup>

#### Toxicity Data†

Human, inhalation,  $\text{TC}_{\text{LD}}$ : 300 mg/m<sup>3</sup>, pulmonary effects

Rabbit, intravenous,  $\text{TD}_{\text{LD}}$ : 20 mg/kg, neoplastic effects

\* These values are for beryllium and its compounds.

† See NIOSH, RTECS (DS1750000), for additional data with references to mutagenic and tumorigenic effects.

### Section 3. Physical Data

Boiling Point: 5378 °F (2970 °C)

Melting Point: 2332 °F (1278 °C)

Vapor Pressure: 7.6 mm Hg at 3470 °F (1910 °C)

Atomic Weight: 9.01 g/mol

Specific Gravity ( $\text{H}_2\text{O} = 1$  at 39 °F (4 °C)): 1.848 at 68 °F (20 °C)

Water Solubility, hot water: Slight

cold water: Insoluble

**Appearance and Odor:** A grayish-white metal with a hexagonal and anisotropic crystal structure (i.e., their index of refraction varies with incident light direction), and a powdered metal, no odor.

### Section 4. Fire and Explosion Data

Flash Point: None reported

Autoignition Temperature: Powder, ca 1200 °F (649 °C)

LEL: None reported

UEL: None reported

**Extinguishing Media:** *Never* use water or  $\text{CO}_2$ . Instead, smother the fire with an approved dry-powder extinguisher. Sand, graphite powder, and sodium chloride are also recommended.

**Unusual Fire or Explosion Hazards:** Beryllium can be a moderate fire hazard if exposed to flame. The hazards increase as particulate size decreases. A beryllium dust cloud can be explosive (areas where dusting may occur require Class 2, Group E electrical services, 29 CFR 1910.309). This material's combustion products are *highly toxic*.

**Special Fire-fighting Procedures:** Fire fighters should use full protective clothing, eye protection, and a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. After exposure to a beryllium fire, they should clean equipment and bathe carefully.

### Section 5. Reactivity Data

**Stability/Polymerization:** Beryllium is stable at room temperature in closed containers.\* Hazardous polymerization cannot occur.

**Chemical Incompatibilities:** Acid and alkali soluble, it reacts with strong bases to evolve hydrogen.† Warm beryllium reacts incandescently with phosphorus, fluorine, or chlorine. Molten lithium metal at 356 °F (180 °C) severely attacks beryllium metal.

**Conditions to Avoid:** When heated in air or in mixed  $\text{CO}_2$  and nitrogen, beryllium is ignitable. Mixtures of the powdered metal with  $\text{CCl}_4$  or trichloroethylene flash on heavy impact.

**Hazardous Products of Decomposition:** Thermal oxidative decomposition of beryllium emits very toxic oxide of beryllium fumes.

\* When moist, beryllium forms thin, acid-resistant oxide films on solid surfaces.

† A simple asphyxiant gas, hydrogen is extremely flammable.

### Section 6. Health Hazard Data

**Carcinogenicity:** The NTP, IARC, and ACGIH list beryllium as a carcinogen. Animal studies also indicate that beryllium produces lung and bone tumors.

**Summary of Risks:** Beryllium is highly toxic by inhalation of fume or dust and exposure to this element and its salts may cause death. Inhaled beryllium is partially deposited in the lungs, the blood system, and finally the bones, thus affecting all organ systems. Since the human body does not quickly eliminate beryllium, trace amounts in urine are detectable as long as 10 years after exposure. Prolonged or repeated skin contact can cause skin irritation or dermatitis. Eye contact can produce conjunctivitis and eye ulcers. If introduced through the skin via cuts or punctures, nonhealing ulcers may develop.

*Continue on next page*

**Section 6. Health Hazard Data, continued**

**Medical Conditions Aggravated by Long-Term Exposure:** Increased risk of lung, liver, gall bladder, and bile duct cancers. **Target Organs:** Lungs, mucous membranes, eyes, skin. **Primary Entry:** Inhalation. **Acute Effects:** Symptoms may occur up to 72 hr after a massive exposure. Acute inhalation can produce pneumonitis with inflammation of the upper and lower respiratory tracts, nasal congestion, nonproductive coughing, and pulmonary edema. High dose exposures may cause acute respiratory distress, brain hemorrhaging, liver inflammation, and spleen hemorrhaging. **Chronic Effects:** Symptoms may be delayed up to 15 years. Chronic exposures result from long-term exposure to small (microgram) quantities and can produce berylliosis. Berylliosis is a progressive granuloma formation in the lungs which eventually causes increasing shortness of breath and, in some cases, death. Since it also circulates among other organs, beryllium causes eventual heart enlargement and failure, liver and spleen enlargement, kidney stones, various malignant tumors, and damaging cell death in any organ in which it accumulates.

**FIRST AID**

**Eyes:** Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.

**Skin:** After rinsing affected area with flooding amounts of water, wash it with soap and water. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. If ingested, have that conscious person drink 1 to 2 glasses of water, then induce repeated vomiting until vomit is clear. Present studies indicate that beryllium is so poorly absorbed through the intestinal tract, that ingestion is not an important hazard (*Industrial Toxicology*, 3<sup>rd</sup> Edition, Hamilton).

After first aid, get appropriate in-plant, paramedic, or community medical attention and support. Watch for signs of respiratory deterioration, and use oxygen as needed.

**Section 7. Spill, Leak, and Disposal Procedures**

**Spill/Leak:** If powdered metal is spilled, notify safety personnel. Evacuate area except for cleanup personnel with protective equipment against contact or inhalation hazards. Provide ventilation and remove heat and ignition sources. To prevent dusting conditions, vacuum or wet mop powder spills. Collect particulate scrap, absorb on paper, and transfer to a sealed recovery or disposal container. **Disposal:** Dissolve beryllium in a small amount of 6M-HCl, filter it, and add a slight excess of 6M-NH<sub>4</sub>OH to the filtrate using litmus as an indicator (blue at pH 8.3). Heat and coagulate the precipitate. After 12 hr, filter and dry it. Handle beryllium waste unsuitable for recycling in accordance with Federal, state, and local regulations. Dispose of scrap or waste material by arranging its return to the supplier in a mutually acceptable form. Contact your supplier or a licensed contractor for detailed recommendations.

**OSHA Designations**

Listed as Air Contaminant (29 CFR 1910.1000, Table Z-2)

**EPA Designations**

RCRA Hazardous Waste (40 CFR 261.33): Not listed

Listed as a CERCLA Hazardous Substance\* (40 CFR 302.4), Reportable Quantity (RQ): 100 lb (45.4 kg) [\* per RCRA, Sec. 3001; per Clean Water Act, Sec. 307(a), 112]

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

SARA Toxic Chemical (40 CFR 372.65): Not listed

**Section 8. Special Protection Data**

**Goggles:** Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

**Respirator:** Wear a NIOSH-approved respirator for emergency and nonroutine use in concentrations above the 8-hr, 2- $\mu\text{g}/\text{m}^3$  TWA. For any time period, a half-mask, air-purifying respirator with a high-efficiency filter is suitable for concentrations as high as 25- $\mu\text{g}$  Be/ $\text{m}^3$  (see NIOSH, *A Recommended Standard for Occupational Exposure to Beryllium*, Sec. 4). A powered, air-purifying respirator equipped with a "fume filter" is suitable for concentrations up to 40  $\mu\text{g}$  Be/ $\text{m}^3$ . A full facepiece, air-purifying respirator with a high-efficiency filter is suitable for concentrations up to 100  $\mu\text{g}$  Be/ $\text{m}^3$ . A powered, air-purifying respirator equipped with a high-efficiency filter, operating in the positive-pressure mode, is suitable for concentrations up to 1000  $\mu\text{g}$  Be/ $\text{m}^3$ . An SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode is suitable for concentrations above 1000  $\mu\text{g}$  Be/ $\text{m}^3$ . Follow OSHA respirator regulations (29 CFR 1910.134). **Warning:** Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. When exposure levels exceed the TLV, change into clean protective clothing and shower at the end of your shift. **Ventilation:** Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PEL standards (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by eliminating it at its source (Genium ref. 103). **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Launder contaminated clothing before wearing. Remove this material from your shoes and equipment. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Section 9. Special Precautions and Comments**

**Storage Requirements:** Clearly label and store beryllium away from incompatible materials (Sec. 5) in a clean, dry, low fire-hazard area. Protect containers from physical damage. **Engineering Controls:** Provide adequate ventilation in areas where beryllium can become airborne. Monitor these areas with personal samplers to limit and control exposure levels. Teach workers about beryllium's potential hazards. Practice good house-keeping to prevent accumulation of beryllium-containing deposits. Give preplacement and annual medical exams (chest x-rays, baseline pulmonary function tests [FVC<sub>1</sub> (functional vital capacity) and FEV<sub>1</sub> (the amount of air exhaled in the first second after maximum inhalation)] and body weight measurements to workers possibly exposed to concentrations above the TLV. Prevent exposing those with pulmonary disease, chronic skin, liver, heart, or kidney conditions; abnormal chest x-ray or blood count; or vital capacity depression greater than 10%. Ensure all engineering systems (production, transportation) are of maximum explosion-proof design. To prevent static sparks, electrically ground and bond all containers and pipelines used in shipping, transferring, reacting, producing, and sampling operations.

**Transportation Data (49 CFR 172.101, .102)**

DOT Shipping Name: Beryllium compound, n.o.s.

IMO Shipping Name: Beryllium, metal powder

DOT Hazard Class: Poison B

IMO Hazard Class: 6.1

DOT ID No.: UN1567

IMO Label: Poison, flammable solid

**MSDS Collection References:** 1-12, 18-20, 24-26, 81, 84, 85, 88-91, 100, 116, 117

**Prepared by:** MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** Warren Silverman, MD

F6



# Genium Publishing Corporation

1145 Catalyn Street  
Schenectady, NY 12303-1836 USA  
(518) 377-8854

## Material Safety Data Sheets Collection:

Sheet No. 83  
Chromium Metal/Powder

Issued: 3/81

Revision: A, 11/89

### Section 1. Material Identification

30

**Chromium Metal/Powder Description:** Obtained from chrome ore, chromite ( $\text{FeCr}_2\text{O}_4$ ), by electrolysis of chromium solutions, by direct reduction (ferrochrome), and by reducing the oxide with finely divided carbon or aluminum. Used for chromeplating other metals; for greatly increasing metal resistance and durability; in manufacturing chrome-steel or chrome-nickel-steel alloys (stainless steel); as a constituent of inorganic pigments; as protective coating for automotive and equipment accessories; and in nuclear and high-temperature research.

**Other Designations:** Chrome; Cr; CAS No. 7440-47-3.

**Manufacturer:** Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide* (Genium ref. 73) for a suppliers list.

R 1  
I 4  
S 1  
K 1

Genium

HMS  
H 2  
F 1  
R 1  
PPG\*  
\* Sec. 8

### Section 2. Ingredients and Occupational Exposure Limits

Chromium metal/powder, ca 100%

OSHA PEL

ACGIH TLV, 1988-89\*

NIOSH REL, 1987†

Toxicity Data‡

8-hr TWA: 1 mg/m<sup>3</sup>

TLV-TWA: 0.5 mg/m<sup>3</sup>

8-hr TWA (for chromium metal  
and insoluble salts): 1 mg Cr/m<sup>3</sup>

Rat, implant,  $\text{TD}_{50}$ : 1200 µg/kg body weight  
administered intermittently over six weeks

\* This TLV is applicable to  $\text{Cr}^{2+}$  and  $\text{Cr}^{3+}$  compounds. For water soluble and water-insoluble  $\text{Cr}^{6+}$ , the 8-hr TWA is 0.05 mg  $\text{Cr}^{6+}$ /m<sup>3</sup>. Certain water-insoluble  $\text{Cr}^{6+}$  compounds (zinc chromate, calcium chromate, lead chromate, barium chromate, strontium chromate, and sintered chromium trioxide) are designated as A1a (human carcinogen).

† The NIOSH REL (10-hr TWA) for carcinogen  $\text{Cr}^{6+}$  compounds is 1 µg/m<sup>3</sup>; for noncarcinogenic  $\text{Cr}^{6+}$  compounds (including chromic acid), the RELs (10-hr TWAs) are 25 µg/m<sup>3</sup> and 50 µg/m<sup>3</sup> (15-min ceiling). The noncarcinogenic compounds include mono- and dichromates of hydrogen, cesium, sodium, lithium, potassium, rubidium, ammonia, and  $\text{Cr}^{6+}$  (chromic acid anhydride). Any and all  $\text{Cr}^{6+}$  materials excluded from the noncarcinogenic group above are carcinogenic  $\text{Cr}^{6+}$  compounds.

‡ See NIOSH, RTECS (GB4200000), for additional data with references to tumorigenic effects.

### Section 3. Physical Data

Boiling Point: 4788 °F (2642 °C)

Atomic Weight: 51.996 g/mol

Melting Point: 3452 °F (1900 °C)

Specific Gravity ( $\text{H}_2\text{O} = 1$  at 39 °F (4 °C)): 7.2 at 68 °F (20 °C)

Vapor Pressure: 1 mm Hg at 2941 °F (1616 °C)

Water Solubility: Insoluble

Vapor Density (Air = 1): 1.79

Appearance and Odor: Steel-gray, lustrous metal; no odor.

### Section 4. Fire and Explosion Data

Flash Point: None reported

Autoignition Temperature: Cloud, 1076 °F (580 °C); dust  
layer, 752 °F (400 °C)

LEL: Dust cloud explosion,  
0.230 oz/ft<sup>3</sup>

UEL: None reported

**Extinguishing Media:** Use dry chemical or sand.

**Unusual Fire or Explosion Hazards:** Particle size and dispersion in air determine reactivity. Chromium powder explodes spontaneously in air, while chromium dust suspended in  $\text{CO}_2$  is ignitable and explosive when heated.

**Special Fire-fighting Procedures:** Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

\*One hundred percent of dust goes through a 74-µm sieve. A 140-mJ spark can ignite a dust cloud.

### Section 5. Reactivity Data

**Stability/Polymerization:** Chromium is stable when properly handled and stored. Hazardous polymerization cannot occur.

**Chemical Incompatibilities:** Chromium reacts readily with dilute, not nitric, acids to form chromous salts. It is soluble in acids (not nitric) and strong alkalis. Its powder is incompatible with strong oxidizing agents, including high  $\text{O}_2$  concentration. Evaporation of mercury (Hg) from Cr amalgam leaves pyrophoric chromium. Finely divided Cr attains incandescence with nitrogen oxide, potassium chlorate, and sulfur dioxide. Molten lithium at 18 °C severely attacks Cr. Fused ammonium nitrate below 200 °C reacts explosively and may ignite or react violently with bromine pentafluoride.

**Hazardous Products of Decomposition:** Thermal oxidative decomposition of Cr can produce toxic chromium oxide fumes.

**Section 6. Health Hazard Data**

**Carcinogenicity:** The NTP and OSHA list chromium as a human carcinogen.

**Summary of Risks:** When ingested chromium is a human poison, with gastrointestinal (GI) effects. Chromium 3 ( $\text{Cr}^{+3}$ ) compounds show little or no toxicity. Less soluble chromium 6 ( $\text{Cr}^{+6}$ ) compounds are suspected carcinogens and severe irritants of the larynx, nasopharynx, lungs, and skin (Sec. 2). Chromic acid or chromate salts cause irritation of the skin and respiratory passage. Ingestion leads to severe irritation of the gastrointestinal tract, renal damage, and circulatory shock. Chromium metal (when heated to high temperatures) and insoluble salts are said to be involved in histological fibrosis of the lungs, which may progress to clinically evident pneumoconiosis. Exposure to chromate dust and powder can cause skin (dermatitis) and eye irritation (conjunctivitis).

**Medical Conditions Aggravated by Long-Term Exposure:** An increased incidence of bronchogenic carcinoma occurs in workers exposed to chromate dust.

**Target Organs:** Respiratory system.

**Primary Entry:** Inhalation, percutaneous absorption, and ingestion.

**Acute Effects:** Acute exposures to dust may cause headache, coughing, shortness of breath, pneumoconiosis, fever, weight loss, nasal irritation, inflammation of the conjunctiva, and dermatitis.

**Chronic Effects:** Asthmatic bronchitis.

**FIRST AID**

**Eyes:** Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.

**Skin:** Brush off chromium dust. After rinsing affected area with flooding amounts of water, wash it with soap and water.

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. If ingested, have that conscious person slowly drink 1 to 2 glasses of water to dilute. Do not induce vomiting. A physician should evaluate all ingestion cases.

**After first aid, get appropriate in-plant, paramedic, or community medical attention and support.**

**Physician's Note:** Acute toxicity causes a two-phase insult: 1) multisystem shock due to gastrointestinal corrosivity and 2) hepatic, renal, hematopoietic insult. Treatment should use ascorbic acid as a neutralizer with gastric lavage. If the ingestion is substantial, exchange transfusions and/or consider hemodialysis. Treat allergic dermatitis with local cortisone or 10% ascorbic acid to reduce  $\text{Cr}^{+6}$  to  $\text{Cr}^{+3}$ . Ten percent EDTA in a lanolin base applied every 24 hr helps heal skin ulcers.

**Section 7. Spill, Leak, and Disposal Procedures**

**Spill/Leak:** Notify safety personnel of large spills. Cleanup personnel should wear protective clothing and approved respirators. Remove heat and ignition sources. Provide adequate ventilation. Keep airborne dust at a minimum. Remove spills quickly and place in appropriate containers for disposal or reuse.

**Disposal:** Reclaim salvageable metal. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**OSHA Designations**

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1)

**EPA Designations**

RCRA Hazardous Waste (40 CFR 261.33): Not listed

Listed as a CERCLA Hazardous Substance\* (40 CFR 302.4), Reportable Quantity (RQ): 1 lb (0.454 kg) [\* per Clean Water Act, Sec. 307(a)]

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

Listed as a SARA Toxic Chemical (40 CFR 372.65)

**Section 8. Special Protection Data**

**Goggles:** Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

**Respirator:** Wear a NIOSH-approved respirator if necessary. Wear an SCBA with a full facepiece when the particle concentration's upper limit is  $50 \text{ mg/m}^3$ .

**Warning:** Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres.

**Other:** Wear impervious rubber gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact.

**Ventilation:** Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA standard (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by eliminating it at its source (Genium ref. 103).

**Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

**Contaminated Equipment:** Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Launder contaminated clothing before wearing. Remove this material from your shoes and equipment.

**Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Section 9. Special Precautions and Comments**

**Storage Requirements:** Store material in cool, dry, well-ventilated area separate from acids and oxidizing agents. Seal and protect containers from physical damage. Keep away from heat or ignition sources.

**Engineering Controls:** Avoid dust inhalation. Practice good housekeeping (vacuuming and wet sweeping) to minimize airborne particulates and to prevent dust accumulation. Use nonsparking tools and ground electrical equipment and machinery.

**Transportation Data** (49 CFR 172.101, .102): Not listed

**MSDS Collection References:** 1, 2, 26, 38, 80, 87, 88, 89, 100, 109, 124, 126

**Prepared by:** MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Hardies, MD

M8



# Genium Publishing Corp.

One Genium Plaza  
Schenectady, NY 12304-4690  
(518) 377-8854

## Material Safety Data Sheets Collection

DDT (Dichlorodiphenyltrichloroethane)  
MSDS No. 155

Date of Preparation: 10/93

### Section 1 - Chemical Product and Company Identification

42

Product/Chemical Name: .... DDT (Dichlorodiphenyltrichloroethane)

Chemical Formula: ..... (ClC<sub>6</sub>H<sub>4</sub>)<sub>2</sub>CHCCl<sub>3</sub>

CAS No.: ..... 50-29-3

Synonyms: Agritan; 2,2-bis(p-chlorophenyl)-1,1,1-trichloroethane; chlorophenothan; Citox; dichlorodiphenyltrichloroethane; Dicophane; diphenyltrichloroethane; Genitox; Kopsol; NCI-C00464; Neocid; Pentech; trichlorobis (4-chlorophenyl) ethane; 1,1'-(2,2,2-trichloroethylidene)bis(4-chlorobenzene), Zerdane.

Derivation: Prepared by condensing chloral or chloral hydrate with chlorobenzene in presence of sulfuric acid.

General Use: One of the most widely used contact insecticides from 1945 until its ban in 1972. Although banned in the U.S. (except for such uses as emergency health situations and for controlling body lice), it is still widely used in the tropics for control of vector-carrying diseases such as malaria, yellow fever, dengue, filariasis, louse-borne typhus, and louse-borne relapsing fever.

### Section 2 - Composition / Information on Ingredients

DDT: *p,p'*DDT 70% wt + *o,p'*DDT 30% wt (technical grade)

Trace Impurities: DDD, DDE

#### OSHA PELs

8-hr TWA: 1 mg/m<sup>3</sup> (skin)

#### ACGIH TLVs

TWA: 1 mg/m<sup>3</sup>

#### NIOSH REL

10-hr TWA: 0.5 mg/m<sup>3</sup>

Ca\*: (Limit of quantitation: 0.1 mg/m<sup>3</sup>)

#### IDLH Level

Ca\*

#### DFG (Germany) MAK (skin)

TWA: 1 mg/m<sup>3</sup> (total dust)

Category III: Substances with systemic effects

Onset of effect: > 2 hr.

Peak Exposure Limit: 10 mg/m<sup>3</sup>, 30 min. average value, 1/shift

\* Ca = Carcinogen

### Section 3 - Hazards Identification

#### ☆☆☆☆ Emergency Overview ☆☆☆☆

DDT is a white to gray, crystalline solid. Although it has been banned in the U.S. because of its persistence in the environment and potential for bioaccumulation, DDT has not produced toxicity in workers who either manufactured or used it (even over many years). However, this lack of toxicity is based on inhalation and skin absorption. If DDT is ingested, especially in large amounts, central nervous system effects will occur with possible liver damage. DDT is considered a confirmed animal carcinogen and a suspected human carcinogen.

#### Potential Health Effects

Primary Entry Routes: Inhalation, ingestion, skin contact.

Target Organs: Central nervous system, liver, skin, peripheral nervous system.

#### Acute Effects

**Inhalation:** Inhalation does not appear to cause toxicity beyond that of minor mechanical irritation.

**Eye:** Exposure to 423 mg/m<sup>3</sup>/1 hr/day for 6 days caused eye irritation.

**Skin:** Skin absorption may occur from some DDT solutions, but degree of absorption will depend on the solvent involved. Aqueous solutions and the powder or crystals are not easily absorbed.

**Ingestion:** DDT can cause a variety of central nervous system effects if ingested. Large doses generally result in vomiting, while smaller doses cause symptoms within 2 to 3 hr post-ingestion. Symptoms include tingling of the lips, tongue, and face; malaise; headache; sore throat; fatigue; tremors of the head, neck, and eyelids; apprehension; ataxia; and confusion. Convulsions and paralysis of the hands is possible in severe exposures (if vomiting does not occur). Vital signs are usually normal, but in severe poisonings, the pulse may be irregular and abnormally slow. Based on animal studies, it is expected that ventricular fibrillation and sudden death can occur at any time during acute poisoning. Recovery from acute poisoning generally occurs within 24 hr except in the most serious cases.

**Carcinogenicity:** DDT is considered a suspected human carcinogen by several governmental agencies. IARC-2B (possibly carcinogenic to humans, limited evidence in humans in the absence of sufficient evidence in experimental animals), NTP-2 (reasonably anticipated to be a carcinogen: limited human evidence or sufficient animal evidence), EPA-B2 (sufficient animal evidence; inadequate human evidence), and NIOSH-X (carcinogen defined without further categorization)

**Medical Conditions Aggravated by Long-Term Exposure:** Possibly, disorders of the central nervous system and liver.

#### Wilson Risk Scale

R 1  
I 3  
S 1\*  
K 2

\*Skin  
absorption

#### HMIS

H 2+  
F 2  
R 0

chronic  
effects

PPE+  
†Sec. 8

# MATERIAL SAFETY DATA SHEET

## GENIUM PUBLISHING CORPORATION

1145 CATALYN ST., SCHENECTADY, NY 12303 USA (518) 377-8854



MSDS # 155  
 BOTTOM ASH  
 (from Oil Combustion)  
 Issued: November 1985  
 Revised:

From Genium's MSDS Collection, to be used as a reference.

<b>SECTION 1. MATERIAL IDENTIFICATION</b>			18
<p><b>MATERIAL NAME:</b> BOTTOM ASH</p> <p><b>MATERIAL SOURCE:</b> Residue from combustion of NO. 6 Fuel Oil.</p> <p><b>GENERATOR:</b> Central Hudson Gas &amp; Electric Corporation          284 South Avenue          Poughkeepsie, NY 12601          Phone #: (914) 452-2000</p>			
<b>SECTION 2. INGREDIENTS AND HAZARDS</b>	<b>%</b>	<b>HAZARD DATA</b>	
<p>The composition will vary, depending upon the source of the No. 6 Fuel Oil. The following is considered a "typical" breakdown, based upon dry weight (except where noted):</p>			
Silicon (Amorphous) .....	38.80	Current (1985-86) ACGIH TLV's and OSHA PEL's as TWA's: 20 mppfc or 6.7 mg/m <sup>3</sup> (as amorphous silica) None established 0.05 mg/m <sup>3</sup> (as V <sub>2</sub> O <sub>5</sub> ) PEL = 0.5 mg/m <sup>3</sup> None established 1 mg/m <sup>3</sup> (if soluble) (No PEL) 1 mg/m <sup>3</sup> ; 0.1 mg/m <sup>3</sup> (if soluble) (PEL = 1 mg/m <sup>3</sup> ) 10.0 mg/m <sup>3</sup> (No PEL) Not applicable None established	
Magnesium .....	6.86		
Vanadium .....	5.40		
Sulfate (soluble wet weight) .....	3.73		
Iron .....	2.80		
Nickel .....	1.49		
Aluminum .....	1.31		
Trace (calcium, sodium, potassium, zinc, copper) .....	<1.0		
Water .....	33.3		
Anionic Species (most probably) from combustion (i.e., carbonates) .....	Balance		
Current (1985-86) ACGIH TLV's.			
<b>SECTION 3. PHYSICAL DATA</b>			
SPECIFIC GRAVITY ..... 1.90 TOTAL ORGANIC CARBON ... 210 mg/kg (Dry Weight) WATER CONTENT (%) ..... 33.3 pH ..... 5 - 6 APPEARANCE & ODOR: Brown, pebbly-like solid; slight sulfur odor.			
<b>SECTION 4. FIRE AND EXPLOSION DATA</b>			
Flash Point and Method	Autoignition Temp.	Flammability Limits in Air	Lower Upper
NONE	NONE	NONE	-- --
Bottom ash is noncombustible. Precautions in fire situations would be dictated by surrounding combustible material. Firefighters should wear self-contained breathing apparatus and full protective gear.			
<b>SECTION 5. REACTIVITY DATA</b>			
This material is stable at room temperature. It is not considered reactive as these are the end products from combustion of No. 6 residual oil. Sulfates may react violently when melted with Aluminum.			

**Chronic Effects:** There are conflicting reports on whether or not DDT produces chronic effects in humans. Although it is well established that chronic exposure in experimental animals produces effects including liver damage, CNS degeneration, dermatitis, weakness, convulsions, coma, and death, these effects are not confirmed in humans. Liver cancer is confirmed in animals, but has not been documented in humans. These conflicting reports appear due to the lack of documented chronic toxicity in workers and data showing that DDT and its metabolites are retained in the body fat for long time periods, thus providing a basis for the *possibility* of chronic toxicity.

**Other:** Solvents such as kerosine are added to DDT as a vehicle and, depending on the type involved, may be more toxic than DDT itself.

### Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

**Skin Contact:** *Quickly* remove contaminated clothing. Rinse away any loose material and wash exposed area with soap and water. For reddened or blistered skin, consult a physician. Carefully dispose of contaminated clothing because it may pose a fire hazard.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water to dilute. *Do not* induce vomiting. Gastric lavage should be performed promptly.

*After first aid, get appropriate in-plant, paramedic, or community medical support.*

**Notes to Physicians:** Effects may be delayed; keep under observation.

**Special Precautions/Procedures:** Amobarbital or pentobarbital is recommended for the relief of central neurological manifestations; tribromoethanol and paraldehyde are recommended for allaying prolonged convulsions.

### Section 5 - Fire-Fighting Measures

**Flash Point:** DDT itself is noncombustible but is dissolved in a variety of solvents. The average quoted Flash Point is 162 °F (72.2 °C) although the specific vehicle is not identified.

**Flash Point Method:** CC

**Autoignition Temperature:** None reported

**LEL:** None reported

**UEL:** None reported

**Flammability Classification:** Class IIIA Combustible Liquid (varies depending on vehicle)

**Extinguishing Media:** For small fires, use dry chemical, water spray, or regular foam. For large fires, use water spray, fog, or regular foam.

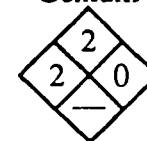
**Unusual Fire or Explosion Hazards:** Container may explode in heat of fire.

**Hazardous Combustion Products:** Chloride fumes and carbon oxide gases.

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways. Fight fire from maximum distance. Stay away from ends of tanks.

**Fire-Fighting Equipment:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural fire fighters' protective clothing is *not* effective.

Genium



### Section 6 - Accidental Release Measures

**Spill /Leak Procedures:** Notify safety personnel, isolate area, deny entry, and stay upwind. Shut off all ignition sources. Cleanup personnel should protect against contamination.

**Small Spills:** For dry spills, carefully scoop up material or vacuum (with an approved filter). Damp mop any residue. For small solution spills, take up with earth, sand, vermiculite, or other absorbent material and place in suitable containers for disposal.

**Large Spills**

**Containment:** Dike far ahead of liquid spill for later reclamation or disposal. Do not release into sewers or waterways.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

### Section 7 - Handling and Storage

**Handling Precautions:** Use non-sparking tools to open containers. Keep dry chemical extinguishers on hand in case of fire.

**Storage Requirements:** Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from heat, ignition sources, and incompatibles (Sec. 10). *Do not* store in aluminum or iron containers.

### Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** To prevent static sparks, electrically ground and bond all equipment used with and around DDT.

**Ventilation:** Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.<sup>(103)</sup>

**Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers with emphasis on the liver and central nervous system.

**SECTION 6. HEALTH HAZARD INFORMATION**

TLV

See Section 2

Chemical analysis of the bottom ash demonstrates the concentrating effect combustion has on the base oil. Uncombustible metallics and oxides are left in the ash. The silicon most probably occurs as amorphous silica and does not present the inhalation hazards of crystalline silica particles. Nickel and nickel compounds have been linked to cancers. Proper precautions must be taken to minimize inhalation exposures. Nickel and vanadium compounds may also cause sensitization to a minor number of individuals. The ash dust may be irritating to the eyes and respiratory tract. Prolonged skin contact may cause irritation and sensitization reactions. Nickel and nickel compounds do present an inhalation hazard.

**FIRST AID:**

**EYE CONTACT:** Flush with water until particles are removed. Have eyes examined by medical personnel.

**SKIN CONTACT:** Wash area with soap and water. If irritation occurs and persists, prevent further contact and seek medical attention.

**INHALATION:** Remove victim to fresh air.

**INGESTION:** Not considered probable.

Note: Some Nickel compounds have been listed as NTP anticipated human carcinogens and IARC probable human carcinogens.

**SECTION 7. SPILL, LEAK AND DISPOSAL PROCEDURES**

Spills are not considered a primary health hazard unless excessive dusting or contamination of surface waters is possible. Dusting must be minimized although the normal water content may prevent dust generation. If dusting is possible, lightly wet down the spill and shovel the ash into suitable containers for reclamation.

Do not allow contamination of surface waters.

Not a hazardous waste per EPA characterization methods.

Follow Federal, State and Local requirements for disposal.

**SECTION 8. SPECIAL PROTECTION INFORMATION**

Prevent dust inhalation by using proper exhaust ventilation or NIOSH-approved respirators with adequate protection factors.

Minimize skin contact by wearing protective clothing including coveralls, hair covering, gloves, etc.

Contact lenses may pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

**SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS**

Prevent skin contact and dust inhalation. Follow good personal hygiene practices.

Do not allow contact with surface waters.

DATA SOURCE(S) CODE (See Glossary) 1, 2, 12, 59, DW.

Judgements as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.

APPROVALS

JO Accrocco, 1/86

INDUST. HYGIENE/SAFETY

DW 1-86

MEDICAL REVIEW:

JED Feb 86



**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For any detectable concentration, use a SCBA with a full facepiece and operated in pressure demand or other positive-pressure mode, or any supplied-air respirator with a full facepiece and operated in pressure demand or other positive-pressure mode with an auxiliary SCBA. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

**Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets made of butyl rubber to prevent prolonged or repeated skin contact. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy.

**Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

**Contaminated Equipment:** Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment.

**Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

## Section 9 - Physical and Chemical Properties

**Physical State:** Solid

**Appearance and Odor:** White to gray crystals or powder which is odorless or has a slight aromatic odor.

**Odor Threshold:** 5.0725 mg/m<sup>3</sup>

**Vapor Pressure:**  $5.5 \times 10^{-6}$  mm Hg at 68 °F (20 °C)

**Formula Weight:** 354.48

**Specific Gravity (H<sub>2</sub>O=1, at 4 °C):** 0.98 to 0.99

**Water Solubility:** 0.0012 ppm

**Other Solubilities (g DDT/100 mL):** acetone 58, 95% alcohol 2, benzene 78, benzyl benzoate 42, carbon tetrachloride 45, chlorobenzene 74, cyclohexanone 116, dibutyl phthalate 33, o-dichlorobenzene 68, dichlorodifluoromethane 2, dioxane 100, ethyl ether 28, gasoline 10, isopropanol 3, kerosine 8 to 10, methylated naphthalenes 40 to 60, mineral oil 5, morpholine 75, peanut oil 11, pine oil 0 to 16, tetralin 61, tributyl phosphate 50, and xylene 60.

**Boiling Point:** 365 °F (185 °C)

**Melting Point:** 227 °F (108.3 °C)

## Section 10 - Stability and Reactivity

**Stability:** DDT is stable at room temperature in closed containers under normal storage and handling conditions. It biodegrades very slowly.

**Polymerization:** Hazardous polymerization does not occur.

**Chemical Incompatibilities:** Strong oxidizers, alkaline materials, iron and aluminum salts.

**Conditions to Avoid:** Exposure to heat, ignition sources, and incompatibles.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of DDT can produce carbon dioxide.

## Section 11 - Toxicological Information

### Toxicity Data:

**Eye Effects:** None reported.

**Skin Effects:** None reported.

#### Acute Oral Effects:

Human, oral, LD<sub>50</sub>: 500 mg/kg caused convulsions, cardiac arrhythmias, and respiratory changes.

Rat, oral, LD<sub>50</sub>: 87 mg/kg; details not reported

**Carcinogenicity:** Rat, oral, TD<sub>Lo</sub>: 1225 mg/kg given for 7 continuous weeks caused liver tumors.

**Mutagenicity:** *E. coli*: 15 µmol/L caused DNA damage.

**Teratogenicity:** Rat, oral, TD<sub>Lo</sub>: 112 mg/kg given to a 56 day old male caused paternal effects (spermatogenesis, testes, epididymis, sperm duct).

\* See NIOSH, RTECS (KJ3325000), for additional toxicity data.

## Section 12 - Ecological Information

**Ecotoxicity:** Glass shrimp (*Palaemonestes kadiakensis*), LC<sub>50</sub> = 2.3 mcg/L/96 hr at 69.8 °F (21 °C); Japanese quail, 2 month old male, (*Coturnix japonica*), LD<sub>50</sub> = 841 mg/kg; bluegill (*Lepomis macrochirus*), LC<sub>50</sub> = 28.7 mcg/L/36 hr.

**Environmental Degradation:** In water, DDT will adsorb strongly to sediments, significantly bioconcentrate in fish, and will be subject to considerable evaporation with an estimated half-life of several hr to almost 50 hr from certain waters. It may biodegrade when high concentrations of required microbes (*Escherichia*, *Hydrogenomonas*, and *Saccharomyces*) are present. On land, DDT will adsorb strongly and should not appreciably leach to groundwater. It may evaporate (half-life of 100 days) and is subject to photooxidation from soil. DDT may significantly biodegrade in flooded soils or under anaerobic conditions provided high populations of the required microbes are present. Half-life ranges from 2 to >15 yr. In the air, DDT is subject to direct photooxidation and reaction with photochemically produced hydroxyl radicals (est. half-life = 2 days). Wet and dry deposition are significant mechanisms for removal from air.

### Section 13 - Disposal Considerations

**Disposal:** DDT is a good candidate for rotary kiln or liquid injection incineration (furnace with afterburner and alkali scrubber). 60 to 80% removal of DDT from contaminated soils has been achieved in 10 min. by super critical-carbon dioxide extraction. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**Container Cleaning and Disposal:** Triple rinse containers. Containers in good condition should be returned to the manufacturer and those that are not reusable should be punctured and transported to a scrap metal facility for recycling, disposal, or burial in a designated landfill.

### Section 14 - Transport Information

#### DOT Transportation Data (49 CFR 172.101):

**Shipping Name:** Organochlorine pesticides, solid toxic, n.o.s.

**Shipping Symbols:** —

**Hazard Class:** 6.1

**ID No.:** UN2761

**Packing Group:** III

**Label:** Keep Away From Food

**Special Provisions (172.102):** —

#### Packaging Authorizations

a) Exceptions: 173.153

b) Non-bulk Packaging: 173.213

c) Bulk Packaging: 173.240

#### Quantity Limitations

a) Passenger, Aircraft, or Railcar: 100 kg

b) Cargo Aircraft Only: 200 kg

#### Vessel Stowage Requirements

a) Vessel Stowage: A

b) Other: 40

### Section 15 - Regulatory Information

#### EPA Regulations:

RCRA Hazardous Waste Number (40 CFR 261.33): U061

Listed as a RCRA Hazardous Waste Classification (40 CFR 261.33)

Listed as a CERCLA Hazardous Substance (40 CFR 302.4) per RCRA, Sec. 3001; CWA, Sec. 311 (b)(4); and CWA, Sec. 307(a)

CERCLA Reportable Quantity (RQ), 1 lb (0.454 kg)

SARA Toxic Chemical (40 CFR 372.65): Not listed

SARA EHS (Extremely Hazardous Substance) (40 CFR 355): Not listed

#### OSHA Regulations:

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)

### Section 16 - Other Information

**References:** 73, 101, 103, 124, 126, 127, 132, 133, 136, 139, 148, 153, 167, 168, 169, 176, 180, 183

**Prepared By** ..... M Gannon, BA

**Industrial Hygiene Review** ..... PA Roy, MPH, CIH

**Medical Review** ..... T Thoburn, MD, MPH

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

# MATERIAL SAFETY DATA SHEET

GENIUM PUBLISHING CORPORATION

1145 CATALYN ST., SCHENECTADY, NY 12303 USA (518) 377-8854



MSDS # 164

STAINLESS STEEL/NICKEL BASE  
(Scrap-Generic)

Issued: December 1985

Revised:

from Genium's MSDS Collection, to be used as a reference.

## SECTION 1. MATERIAL IDENTIFICATION

13

**MATERIAL NAME:** STAINLESS STEEL/NICKEL BASE (Scrap-Generic)

**OTHER DESIGNATIONS:** INCO; INCONEL; HASTALLOY "X"; AISI\* 286, 304, 305, 308; AISI 309, 310, 314, 316, 317, 329, 347, 348, 405, 409, 410, 414, 440's, 450's.\*\*

**DESCRIPTION:** An alloy of Iron, Nickel, and Chromium, with possible traces of the elements Tungsten, Carbon, Manganese, Sulfur, and Silicon.

\*American Iron & Steel Institute

\*\*Numbers refer to stainless steel alloys with high nickel content (10-40%)



## SECTION 2. INGREDIENTS AND HAZARDS

%

HAZARD DATA

**BASE METAL:** Nickel (Ni) CAS #7440 02 0  
Chromium (Cr) CAS #7440 47 3  
Iron (Fe) CAS #1309 37 1

10-40  
10-30  
1-30

\*PEL (OSHA) \*\*TLV (ACGIH)  
1 mg/m<sup>3</sup> 1 mg/m<sup>3</sup>  
1 mg/m<sup>3</sup> 0.5 mg/m<sup>3</sup>  
10 mg/m<sup>3</sup>\*\*\* 5 mg/m<sup>3</sup>\*\*\*  
\*\*\* as Iron Oxide Fume.

\* OSHA Permissible Exposure Limit (PEL)

\*\* ACGIH Threshold Limit Values (TLV's)

NOTE: Chromium, cobalt, and nickel in various chemical compounds have been identified as suspected human carcinogens by the IARC, NTP Annual Report.

## SECTION 3. PHYSICAL DATA

Boiling point @ 1 atm ..... Approx. 5000°F

Melting point ..... Approx. 2500°F

Vapor pressure @ 20°C (mm Hg) ... NA

Solubility in water ..... Insoluble

Vapor density (Air=1) ..... NA

Evaporation rate (BuAc=1) ... NA

% Volatile by Volume ..... NA

APPEARANCE & ODOR: Solid, variously shaped, odorless, silver-colored metal.

## SECTION 4. FIRE AND EXPLOSION DATA

Lower

Upper

Flash Point and Method

Autoignition Temp.

Flammability Limits in Air

NONE

NONE

NONE

NA

NA

EXTINGUISHING MEDIA: Will not burn. Use water to cool.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Fine metal particles produced when ground, sawed, etc., can burn. High concentration of these particles in the air may present an explosion hazard. Good housekeeping and adequate ventilation are recommended. Use air-supplied or self-contained breathing apparatus if fires are in enclosed areas.

## SECTION 5. REACTIVITY DATA

This material is stable under most conditions.

INCOMPATIBILITY: Reacts with strong acids to yield hydrogen (H<sub>2</sub>) gas.

DECOMPOSITION PRODUCTS: Metallic oxides (chromates, iron oxide). See Section 9 - Special Precautions.

**SECTION 6. HEALTH HAZARD INFORMATION**

TLV

See Section 2

Section 2 lists specific ingredients and exposure limits. Stainless steel is poorly absorbed through the skin or alimentary canal, and while in the solid state it is not considered an inhalation hazard. Operations such as welding, dust generation, or fume generation could allow exposure to the elements present in alloy. Therefore, it is important to maintain exposure levels below the regulated levels as noted in Section 2. Determine actual exposures by industrial hygiene monitoring. Short-Term Exposure to steel dusts or fumes produces metallic taste; tightness of chest; fever; irritation to eyes, nose, throat, and skin. Long-Term Exposure to steel dusts or fumes may cause skin sensitization (principally by exposure to nickel) and respiratory disease such as bronchial asthma, lung fibrosis, or pneumoconiosis. Exposure to iron oxide fumes may cause a benign pneumoconiosis called siderosis. Nickel and chromium have been determined by the IARC to be suspected carcinogens.

FIRST AID: EYE CONTACT: Protect eyes from particulates or fume. Wash exposed eyes with copious amounts of water for at least 15 minutes.

SKIN CONTACT: Protect skin from cuts and heat or hot procedures or processes. Avoid contact to prevent nickel dermatitis.

INHALATION: Move to fresh air, Restore or support breathing as required.

INGESTION: NA

**SECTION 7. SPILL, LEAK AND DISPOSAL PROCEDURES**

Sell as scrap or landfill, clean up spills as inert solid.

DISPOSAL: Dispose of in accordance with OSHA, EPA, state, or local regulations.

**SECTION 8. SPECIAL PROTECTION INFORMATION**

RESPIRATORY PROTECTION: Use NIOSH/MSHA-approved air-purifying dust and fume respirator when airborne concentrations exceed the TLV's/PEL's listed in Section 2 while cutting, grinding, welding, or remelting. Use air-supplied or self-contained breathing apparatus (SCBA) in confined spaces.

VENTILATION: Use local exhaust when cutting, grinding, welding, or remelting. Confined spaces require special attention to provide adequate ventilation.

EYE PROTECTION AND PROTECTIVE CLOTHING: Eye and face protection required while welding, grinding, cutting, or remelting. Wear gloves and suitable flame-retardant clothing. While welding, wear proper shade number. Good personal hygiene and safe work practices are necessary.

Contact lenses pose a special hazard; soft lenses may absorb and all lenses concentrate irritants.

**SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS**

Always maintain exposures below the established PEL's/TLV's. Always use exhaust ventilation when feasible. Arc and sparks generated when welding could be a source of ignition for combustible and flammable materials. Avoid welding in the presence of chlorinated solvent because this may generate phosgene (carbonyl chloride) and hydrogen chloride (HCl) gases.

This material is potentially contaminated with materials such as oil or other contaminants. If the material is contaminated, precautions necessary to the contaminants should be considered when handling, welding, cutting, and/or heating or melting.

DATA SOURCE(S) CODE (See Glossary) 2, 4, 6, 7, 9, 12, 14, 19, 30, 31, 40, 59, OW

Judgements as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations and assumes no responsibility as to the accuracy or suitability of such information for application to purchaser's intended purposes or for consequences of its use.

APPROVALS: *JO Accorco, 3/86*

INDUST. HYGIENE/SAFETY *JW 3-86*

MEDICAL REVIEW: *Mar 86*



# Genium Publishing Corp.

One Genium Plaza  
Schenectady, NY 12304-4690  
(518) 377-8854

## Material Safety Data Sheet Collection

Arsenic Trioxide

MSDS No. 194

Date of Preparation: 6/86

Revision: A, 4/95

### Section 1 - Chemical Product and Company Identification

46

**Product/Chemical Name:** Arsenic Trioxide

**Chemical Formula:** As<sub>2</sub>O<sub>3</sub>

**CAS Number:** 1327-53-3

**Synonyms:** arsenic oxide, arsenic (III) oxide, arsenic sesquioxide, arsenicum album, arsenious acid, arsenious acid anhydride, arsenious oxide, arsenious trioxide, arsenite, arsenolite, arsenous acid, arsenous acid anhydride, arsenous anhydride, claudelite, claudetite, crude arsenic, diarsenic trioxide, white arsenic

**Derivation:** By smelting of copper and lead concentrates, adding pyrite or galena to yield arsenic trioxide vapor and condensation to yield 90 to 95% pure arsenic trioxide. Re-sublimation will yield 99 +%. Available in crystals (monoclinic-claudetite; cubic-arsenolite) and amorphous lumps.

**General Use:** No longer produced in the US, but it is imported. Used in the manufacture of other arsenic compounds, glass (decolorizer), Paris green, enamels, weed killers, insecticides, and rodenticides; for preserving hides and wood, and as a textile mordant. Formerly used in veterinary medicine.

**Vendors:** Consult the latest *Chemical Week Buyers' Guide*. (73)

### Section 2 - Composition / Information on Ingredients

Arsenic trioxide, ca 95 to 99+% wt (various purities are available).

Trace Impurities: 10,000 to 20,000 ppm antimony, 300 to 600 ppm lead and iron, 100 to 800 ppm copper, 300 ppm zinc, and 15 ppm cadmium, selenium, mercury, and tellurium.

#### OSHA PEL

Inorganic compounds, as As  
8-hr TWA: 0.01 mg/m<sup>3</sup>

#### NIOSH REL

Inorganic compounds, as As  
15-min Ceiling: 0.002 mg/m<sup>3</sup>

#### DFG (Germany) MAK

None established

#### ACGIH TLV

Inorganic compounds, as As  
8-hr TWA: 0.01 mg/m<sup>3</sup>

#### IDLH Level

5 mg/m<sup>3</sup> as As

### Section 3 - Hazards Identification

#### ☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Arsenic trioxide exists as odorless, tasteless, white or transparent, amorphous lumps or crystalline powder. It is irritating to the eyes, skin, and respiratory tract. Severe acute and chronic toxicity occurs via all routes of exposure and includes peripheral nervous system damage, anemia, and possible cancer of the respiratory tract and skin. Arsenic trioxide is easily absorbed through the skin. It is not combustible.

#### Potential Health Effects

**Primary Entry Routes:** Inhalation, eye and skin contact/absorption.

**Target Organs:** Kidneys, liver, lungs, skin, lymphatic system, peripheral nervous system, bone marrow.

#### Acute Effects

**Inhalation:** Symptoms include irritation of the respiratory tract, headache, coughing, difficulty breathing, chest pains, and pulmonary edema (fluid in lungs).

**Eye:** Irritation of the eye and conjunctiva.

**Skin:** Irritation of the skin.

**Ingestion:** Symptoms generally occur within 30 to 60 minutes but may be delayed for several hours if ingested with food. Symptoms include a metallic or garlic taste in the mouth, nausea and vomiting, abdominal pain, difficulty swallowing, and profuse, watery, sometimes bloody diarrhea, dehydration, intense thirst, fluid-electrolyte disturbances, severe hypotension (low blood pressure), metabolic acidosis, hemolysis (breakage of red blood cells), pancytopenia (reduction in all formed blood elements), anemia, Mee's lines (transverse white lines in the nails), peripheral neuropathy (damage to the peripheral nerves resulting in sensation and motor disturbances) with muscle wasting, tingling sensations, and burning pain in a "stocking and glove" distribution. Brain damage (1 to 6 months post exposure) may also occur. Human fatal dose = 1 to 2.5 mg/kg.

**Carcinogenicity:** The following agencies list arsenic trioxide (as arsenic compounds) as a carcinogen: EPA-A (Human carcinogen with sufficient epidemiological evidence to support a casual association between exposure and cancer), IARC-1 (carcinogenic to humans, sufficient evidence of carcinogenicity), DFG MAK-A1 (capable of inducing malignant tumors as shown by experience with humans), NIOSH-X (carcinogen defined with no further categorization), and OSHA-X (Carcinogen defined with no further categorization). The ACGIH lists arsenic trioxide *production* as TLV-A2 (Suspected human carcinogen).

**Medical Conditions Aggravated by Long-Term Exposure:** Blood or liver disorders.

#### Wilson Risk Scale

R 1  
I 4  
S 1\*  
K 1

\*Skin  
absorption

#### HMIS

H 3\*  
F 0  
R 0

\*Chronic  
effects

PPE<sup>+</sup>

<sup>+</sup>Sec. 8

**Chronic Effects:** Symptoms include nasal, eye, and skin irritation, tearing, photophobia (sensitivity to light), hair loss, perforation of the nasal septum (tissue between the nostrils), hoarse voice, cirrhosis of the liver (rare), nausea and vomiting (infrequent), aplastic anemia (anemia characterized by defective functioning of blood-forming organs such as bone marrow and caused by exposure to chemicals or x-rays), and painful ulceration of the wrists, scrotal skin, lips, and nostrils.

**Other:** Ingestion of arsenic trioxide has caused premature birth with subsequent death. Arsenic trioxide can be passed to an infant through breast milk.

### Section 4 - First Aid Measures

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Eye Contact:** *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation persist.

**Skin Contact:** *Quickly* remove contaminated clothing. *Do not* shake arsenic trioxide dusts off clothing! Rinse with flooding amounts of water to remove loose material followed by a thorough soap and water wash. For reddened or blistered skin, consult a physician.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** Support respiratory and cardiovascular function. Assure adequate hydration and renal function: alkalinization of the urine may prevent disposition of red blood cell products from hemolysis in renal tubular cells.

**Special Precautions/Procedures:** Chelation therapy may be indicated if urine arsenic levels exceed 200 µg/liter or higher.

### Section 5 - Fire-Fighting Measures

**Flash Point:** Noncombustible.

**Autoignition Temperature:** Noncombustible.

**LEL:** None reported.

**UEL:** None reported.

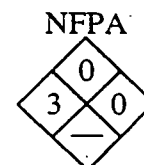
**Extinguishing Media:** Use agents suitable for surrounding fire.

**Unusual Fire or Explosion Hazards:** None reported.

**Hazardous Combustion Products:** Arsenic trioxide fumes and arsine gas.

**Fire-Fighting Instructions:** Do not release runoff from fire control methods to sewers or waterways.

**Fire-Fighting Equipment:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.



### Section 6 - Accidental Release Measures

**Spill /Leak Procedures:** Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind.

**Small Spills:** *Do not sweep!* Carefully scoop up or vacuum (with appropriate filter) and place in suitable container.

**Large Spills**

**Containment:** Flush spill to containment area with water for later reclamation or disposal. Neutralize spill with agricultural lime, crushed limestone, or sodium bicarbonate. *Do not* release into sewers or waterways.

**Cleanup:** Damp mop any residue with dilute sodium bicarbonate solution.

**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

### Section 7 - Handling and Storage

**Handling Precautions:** Use only with adequate ventilation. Wear appropriate PPE to prevent inhalation and skin/eye contact.

**Storage Requirements:** Store in a cool, dry, well-ventilated area away from incompatibles (Sec. 10). Floors and shelves should be made of an impermeable material to prevent absorption of arsenic trioxide.

**Regulatory Requirements:** Follow 29 CFR 1910.1018.

### Section 8 - Exposure Controls / Personal Protection

**Engineering Controls:** Enclose all processes where possible to prevent dispersion of dusts into work area.

**Ventilation:** Provide general or local exhaust ventilation systems to maintain airborne concentrations below OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source. (103)

**Administrative Controls:** Consider preplacement and periodic medical exams of exposed workers. Measurement of arsenic levels in urine can be indicative of exposure. Advise against seafood ingestion for 48 to 72 hr prior to testing.

**Respiratory Protection:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. The following recommendations are for inorganic arsenic compounds. For any detectable concentration, use a SCBA with a full facepiece operated in pressure-demand or other positive-pressure mode or any supplied-air respirator with a full facepiece operated in pressure demand or other positive pressure mode in combination with an auxiliary SCBA. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.** If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical

certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. Due to the potential skin irritation associated with respirator use and arsenic dust exposure, workers should be allowed to leave work area every two hours to wash face and obtain a clean respirator.

**Protective Clothing/Equipment:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent prolonged or repeated skin contact. Butyl rubber and polycarbonate have been suggested as suitable materials for PPE. Barrier creams such as those which are silicone-based will provide some protection against absorption of arsenic trioxide through the skin. Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

**Safety Stations:** Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

**Contaminated Equipment:** Separate contaminated work clothes from street clothes. *Do not* shake or blow arsenic trioxide dusts off clothing! Launder before reuse. Laundry personnel should be informed of the health hazards associated with arsenic trioxide and provided with PPE to protect against exposure. Remove arsenic trioxide from your shoes and PPE.

**Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using arsenic trioxide, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

## Section 9 - Physical and Chemical Properties

**Physical State:** Solid

**Appearance and Odor:** White or transparent crystals (monoclinic - *claudetite*), (cubic - *arsenolite*); or amorphous lumps; odorless; tasteless

**Vapor Pressure:** 66 mm Hg at 406.4 °F (312 °C)

**Formula Weight:** 197.82

**Density (H<sub>2</sub>O=1, at 4 °C):** 4.15 g/cm<sup>3</sup> (*claudetite*), 3.856 g/cm<sup>3</sup> (*arsenolite*)

**Water Solubility:** 1.82 % (*claudetite*), 1.2 % (*arsenolite*) at 68 °F (20 °C). Soluble in 15 parts water at 212 °F (100 °C).

**Other Solubilities:** Soluble in alkali hydroxide or carbonate solutions, acids, and glycerol; insoluble in alcohol, chloroform, and ether.

**Boiling Point:** 869 °F (465 °C), sublimes

**Melting Point:** 595.4 °F (313 °C), *claudetite*; 527 °F (275 °C), *arsenolite*

**Refractive Index:** 1.871, 1.92, 2.01 (*claudetite*); 1.755 (*arsenolite*)

**Henry's Law Constant:**  $1.7 \times 10^{-12}$  atm/m<sup>3</sup>/mole

## Section 10 - Stability and Reactivity

**Stability:** Arsenic trioxide is stable at room temperature in closed containers under normal storage and handling conditions.

**Polymerization:** Hazardous polymerization does not occur.

**Chemical Incompatibilities:** Tannic acid, infusion cinchona, and other vegetable astringent fusions and decoctions, acids (forms volatile, highly toxic arsine gas), halogens (rubidium chloride, chlorine trifluoride, fluorine, sodium chlorate, hydrogen fluoride), aluminum, zinc fillings (explodes upon heating), sodium nitrate, and mercury. Corrosive to many metals in the presence of moisture.

**Conditions to Avoid:** Exposure to incompatibles, elevated temperatures, and dispersion into air.

**Hazardous Decomposition Products:** Thermal oxidative decomposition of arsenic trioxide can produce arsenic trioxide fumes and arsine gas.

## Section 11 - Toxicological Information

### Toxicity Data:\*

#### Acute Oral Effects:

Human, oral, LD<sub>50</sub>: 1429 µg/kg

Human, oral, LD<sub>50</sub>: 29 mg/kg caused changes in sleep, muscle weakness, hypermotility, and diarrhea.

Rat, oral, LD<sub>50</sub>: 14600 µg/kg

#### Multiple Dose Toxicity Data:

Rat, inhalation: 31 µg/m<sup>3</sup>/24 hr administered continuously for 22 weeks produced toxic effects of the brain and coverings.

#### Reproductive Effects:

Woman, oral: 600 mg/kg taken in the 30th week of pregnancy resulted in premature birth with subsequent death.

Mouse, inhalation: 28,500 µg/m<sup>3</sup>/4 hr administered from 9 to 12 days of pregnancy produced cytologic effects (including somatic cell genetic material) and specific developmental abnormalities of the musculoskeletal system.

#### Mutagenicity:

Human, HeLa cell: 500 µmol caused DNA inhibition.

Human, lymphocyte: 2 µg/cm<sup>3</sup> caused sister chromatid exchange.

\* See NIOSH, RTECS (CG3325000), for additional toxicity data.

## Section 12 - Ecological Information

**Ecotoxicity:** Salmon, LC<sub>50</sub> = 8,330 mcg/L/48 hr; pink salmon, LC<sub>100</sub> = 7,195 mcg/L/7 days; fathead minnow, LC<sub>50</sub> = 109 mg/L/96 hr

**Environmental Fate:** Arsenic trioxide adsorbs strongly to soil and sediment in water, especially those soils/sediment which contain clay or are high in ferrous and aluminum oxides. Its half-life in soil is ~ 6.5 years. In water, inorganic trivalent arsenic is slowly oxidized to pentavalent arsenic at neutral pH. Oxidation is more rapid in strong acid or base solutions. Arsenic trioxide may also undergo reduction, methylation, and demethylation conversion to alkyl arsines which are volatile and can lead to

dissipation into the atmosphere. Arsenic trioxide may be found bound to particulates in air (generally < 2 µm in diameter) and transported by wind and air currents. Deposition will eventually occur (dry or precipitation). Typical residence time in air is ~ 9 days (varies depending on particle size and weather conditions).

**Bioconcentration:** BCF = 4 (*Lepomis macrochirus* at 28 days), 10 (*Daphnia magna* at 21 days).

### Section 13 - Disposal Considerations

**Disposal:** Arsenic trioxide is a poor candidate for incineration. For small quantities, dissolve in a minimum amount of hydrochloric acid. Add to water until a white precipitate forms. Add 6 M hydrochloric acid again. Saturate with hydrogen sulfide. Filtrate, wash the precipitate, dry, package, and return to supplier. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**Disposal Regulatory Requirements:** Follow 29 CFR 1910.1018.

**Container Cleaning and Disposal:** Triple rinse containers. Dispose of rinse water as described above.

### Section 14 - Transport Information

#### DOT Transportation Data (49 CFR 172.101):

**Shipping Name:** Arsenic trioxide

**Shipping Symbols:** -

**Hazard Class:** 6.1

**ID No.:** UN1561

**Packing Group:** II

**Label:** Poison

**Special Provisions (172.102):** -

**Packaging Authorizations**

a) Exceptions: None

b) Non-bulk Packaging: 173.212

c) Bulk Packaging: 173.242

**Quantity Limitations**

a) Passenger, Aircraft, or Railcar: 25 kg

b) Cargo Aircraft Only: 100 kg

**Vessel Stowage Requirements**

a) Vessel Stowage: A

b) Other: -

### Section 15 - Regulatory Information

#### EPA Regulations:

Listed as a RCRA Hazardous Waste (40 CFR 261.33): P012

CERCLA Hazardous Substance (40 CFR 302.4) listed specific per RCRA, Sec. 3001 and CWA, Sec. 311 (b)(4)

CERCLA Reportable Quantity (RQ), 1 lb (0.454 kg)

Listed (as arsenic compounds) as a SARA Toxic Chemical (40 CFR 372.65)

SARA EHS (Extremely Hazardous Substance) (40 CFR 355), Threshold Planning Quantity (TPQ): 100/10,000 lb\*

#### OSHA Regulations:

Listed (as inorganic arsenic compounds as As) as an Air Contaminant (29 CFR 1910.1000, Table Z-1, Z-1-A)

OSHA Specifically Regulated Substance (29 CFR 1910.1018, *arsenic compounds*)

\* The lower quantity applies only if the solid exists in powdered form with a particle size of < 100 microns, or is handled in solution or molten form, or meets the NFPA rating of 2, 3, or 4 for reactivity. If the solid does not meet any of these criteria, it is subject to the upper quantity.

### Section 16 - Other Information

**References:** 73, 103, 124, 136, 149, 176, 189, 190, 197, 200, 201, 204, 205

**Prepared By** ..... M Gannon, BA

**Industrial Hygiene Review** ..... RE Langford, PhD, CIH

**Medical Review** ..... R Teichman, MD

**Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.





# Genium Publishing Corporation

One Genium Plaza  
Schenectady, NY 12304-4690 USA  
(518) 377-8854

## Material Safety Data Sheets Collection:

Sheet No. 683

Polychlorinated Biphenyls (PCBs)

Issued: 11/88

Revision: A, 9/92

### Section 1. Material Identification

39

**Polychlorinated Biphenyls** [ $C_{12}H_{10-n}Cl_n$  ( $n=3, 4, 5$ )] **Description:** A class of nonpolar chlorinated hydrocarbons with a biphenyl nucleus (two benzene nuclei connected by a single C-C bond) in which any or all of the hydrogen atoms have been replaced by chlorine. Commercial PCBs are mixtures of chlorinated biphenyl isomers with varying degrees of chlorination. Prepared industrially by the chlorination of biphenyl with anhydrous chlorine in the presence of a catalyst such as ferric chloride or iron filings. Except for limited research and development applications, PCBs have not been produced in the US since 1977. When large quantities of PCBs were manufactured in the US, they were marketed under the tradename Aroclor (Monsanto) and were characterized by four digit numbers. The first two digits indicating biphenyls (12), triphenyls (54), or both (25, 44); the last two digits indicating the weight percent of chlorine. PCBs' thermal stability, nonflammability, and high dielectric capability made them very useful in electrical equipment. Formerly used as additives in hydraulic fluids, heat transfer systems, lubricants, cutting oils, printer's ink, fire retardants, asphalt, brake linings, automobile body sealants, plasticizers, adhesives, synthetic rubber, floor tile, wax extenders, dedusting agents, pesticide extenders, and carbonless reproducing paper. PCBs are still used in certain existing electrical capacitors and transformers that require enhanced electrical protection to avoid heating from sustained electric faults.

**Other Designations:** CAS No. 1336-36-3, Aroclor, Clophen, Chlorestol, chlorinated biphenyls, chlorinated diphenyl, chlorinated diphenylene, chloro biphenyl, chloro-1,1-biphenyl, Dykanol, Fenclor, Inerteen, Kaneclor, Montar, Noflamol, Phenoclor, Pyralene, Pyranol, Santotherm, Sovol, Therminol FR-1

**Cautions:** PCBs are potent liver toxins that may be absorbed through skin. Potentially, chronic or delayed toxicity is significant because PCBs accumulate in fatty tissue and may reasonably be anticipated to be carcinogens. PCBs are a bioaccumulative environmental hazard. When burned, decomposition products may be more hazardous than the PCBs.

R 1	NFPA
I 4	1
S 3*	2
K 1	0
* Skin absorption	HMIS
	H 2+
	F 1
	R 0
	PPE+
	† Sec. 8
	‡ Chronic Effects

### Section 2. Ingredients and Occupational Exposure Limits

PCBs, contain various levels of polychlorinated dibenzofurans and chlorinated naphthalenes as contaminants

1991 OSHA PELs, Skin

8-hr TWA (Chlorodiphenyl, 42% chlorine): 1 mg/m<sup>3</sup>

8-hr TWA (Chlorodiphenyl, 54% chlorine): 0.5 mg/m<sup>3</sup>

1990 DFG (Germany) MAK, Danger of Cutaneous Absorption

TWA (Chlorodiphenyl, 42% chlorine): 0.1 ppm (1 mg/m<sup>3</sup>)

Category III: Substances with systemic effects, onset of effect > 2 hr., half-life > shift length (strongly cumulative)

Short-term Level: 1 ppm, 30 min., average value, 1 per shift

TWA (Chlorodiphenyl, 54% chlorine): 0.05 ppm (0.5 mg/m<sup>3</sup>)

Category III: (see above)

Short-term Level: 0.5 ppm, 30 min., average value, 1 per shift

1985-86 Toxicity Data\*

Rat, oral, TD: 1250 mg/kg administered intermittently for 25 weeks produced liver tumors.

Mammal, oral, TD<sub>01</sub>: 325 mg/kg administered to female for 30 days prior to mating and from the 1st to the 36th day of gestation produced effects on newborn (stillbirth; live birth index; viability index).

1990 NIOSH REL

TWA (Chlorodiphenyl, 42% chlorine): 0.001 mg/m<sup>3</sup>

TWA (Chlorodiphenyl, 54% chlorine): 0.001 mg/m<sup>3</sup>

1992-93 ACGIH TLVs, Skin \*

TWA (Chlorodiphenyl, 42% chlorine): 1 mg/m<sup>3</sup>

TWA (Chlorodiphenyl, 54% chlorine): 0.5 mg/m<sup>3</sup>

\* These guidelines offer reasonably good protection against systemic intoxication, but may not guarantee that chloroacne won't occur.

† See NIOSH, RTECS (TQ1350000), for additional reproductive, tumorigenic, and toxicity data.

### Section 3. Physical Data\*

**Boiling Point:** 644-707 °F (340-375 °C)

**Melting Point:** 42%: -2.2 °F (-19 °C); 54%: 14 °F (-10 °C)

**Vapor Pressure:** 1 mm Hg at 100 °F (38 °C); 10<sup>-6</sup> to 10<sup>-3</sup> mm at 20 °C

**Molecular Weight:** 188.7 to 398.5

**Specific Gravity:** 1.3 to 1.8 at 20 °C

**Water Solubility:** Low solubility (0.007 to 5.9 mg/L)

**Other Solubilities:** Most common organic solvents, oils, and fats; slightly soluble in glycerol and glycols.

**Appearance and Odor:** PCBs vary from mobile oily liquids to white crystalline solids and hard non-crystalline resins, depending upon chlorine content.

\* Physical and chemical properties vary widely according to degree and to the position of chlorination.

### Section 4. Fire and Explosion Data

**Flash Point:** 286-385 °F (141-196 °C) OC\*

**Autoignition Temperature:** 464 °F (240 °C) LEL: None reported

UEL: None reported

**Extinguishing Media:** Use extinguishing media suitable to the surrounding fire. Use dry chemical, foam, carbon dioxide (CO<sub>2</sub>), or water spray. Water spray may be ineffective. Use water spray to cool fire-exposed containers or transformers. Do not scatter PCBs with high-pressure water streams. **Unusual Fire or Explosion Hazards:** Combustion products (hydrogen chloride, phosgene, polychlorinated dibenzofurans, and furans) are more hazardous than the PCBs themselves. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Approach fire from upwind to avoid highly toxic decomposition products. Structural firefighter's protective clothing will provide limited protection. Do not release runoff from fire control methods to sewers or waterways. Dike for later disposal.

\* Flash points shown are a range for various PCBs. Some forms do not have flash points.

### Section 5. Reactivity Data

**Stability/Polymerization:** PCBs are very stable materials but are subject to photodechlorination when exposed to sunlight or UV (spectral region above 290 nanometers). Hazardous polymerization cannot occur. **Chemical Incompatibilities:** PCBs are chemically inert and resistant to oxidation, acids, and bases. **Conditions to Avoid:** Avoid heat and ignition sources.

**Hazardous Products of Decomposition:** Thermal oxidative decomposition [1112-1202 °F (600-650 °C)] of PCBs can produce highly toxic derivatives, including polychlorinated dibenzo-para-dioxins (PCDDs), polychlorinated dibenzofurans (PCDFs), hydrogen chloride, phosgene and other irritants.

**Section 6. Health Hazard Data**

**Carcinogenicity:** The IARC<sup>(16)</sup> and NTP<sup>(17)</sup> list PCBs as an IARC probable carcinogen (overall evaluation is 2A; limited human data; sufficient animal data) and NTP anticipated carcinogen, respectively. **Summary of Risks:** PCBs are potent liver toxins that can be absorbed through unbroken skin in toxic amounts without immediate pain or irritation. PCBs have low acute toxicity, but can accumulate in fatty tissue and severe health effects may develop later. Generally, toxicity increases with a higher chlorine content; PCB-oxides are more toxic. The toxic action on the liver also increases with simultaneous exposure to other liver toxins, e.g. chlorinated solvents, alcohol, and certain drugs. Pathological pregnancies (abnormal pigmentations, abortions, stillbirths, and underweight births) have been associated with increased PCB serum levels in mothers; PCBs can be passed in breast milk. PCBs can affect the reproductive system of adults. **Medical Conditions Aggravated by Long-Term Exposure:** Skin, liver, and respiratory disease. **Target Organs:** Skin, liver, eyes, mucous membranes, and respiratory tract. **Primary Entry Routes:** Inhalation, dermal contact, ingestion. **Acute Effects:** Exposure to PCB vapor or mist is severely irritating to the skin, eyes, nose, throat, and upper respiratory tract. Intense acute exposure to high concentrations may result in eye, lung, and liver injury. Systemic effects include nausea, vomiting, increased blood pressure, fatigue, weight loss, jaundice, edema and abdominal pain. Cognitive, neurobehavior and psychomotor impairment and memory loss have also been seen after acute exposure. **Chronic Effects:** Repeated exposure to PCBs can cause chloroacne; redness, swelling, dryness, thickening and darkening of the skin and nails; swelling and burning of the eyes, and excessive eye discharge; distinctive hair follicles; gastrointestinal disturbances; neurological symptoms including headache, dizziness, depression, nervousness, numbness of the extremities, and joint and muscle pain; liver enlargement; menstrual changes in women; and chronic bronchitis. Cancer, primarily liver, is also a possible result of exposure, but data is inconclusive.

**FIRST AID** **Eyes:** Do not allow victim to rub or keep eyes tightly shut. Rinsing eyes with medical oil (olive, mineral) initially may remove PCB and halt irritation better than water rinsing alone. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately. **Skin:** Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. Multiple soap and water washings are necessary. Avoid the use of organic solvents to clean the skin. For reddened or blistered skin, consult a physician. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** In most cases, accidental PCB ingestion will not be recognized until long after vomiting would be of any value. Never give anything by mouth to an unconscious or convulsing person. Vomiting of the pure substance may cause aspiration. Consult a physician. **Note to Physicians:** Monitor patients for increased hepatic enzymes, chloroacne, and eye, gastrointestinal, and neurologic symptoms listed above. Diagnostic tests include blood levels of PCBs and altered liver enzymes.

**Section 7. Spill, Leak, and Disposal Procedures**

**Spill/Leak:** Notify safety personnel, evacuate all unnecessary personnel, provide adequate ventilation, and isolate hazard area. Cleanup personnel should protect against vapor inhalation and skin or eye contact. For small spills, take up with sand or other noncombustible material and place into containers for later disposal. For larger spills, dike far ahead of spill to contain for later disposal. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** PCBs have been shown to bio-concentrate significantly in aquatic organisms. **Ecotoxicity:** Bluegill, TLm: 0.278 ppm/96 hr. Mallard Duck, LD<sub>50</sub>: 2000 ppm. **Environmental Degradation:** In general, the persistence of PCBs increases with an increase degree of chlorination. **Soil Absorption/Mobility:** PCBs are tightly absorbed in soil and generally do not leach significantly in most aqueous soil systems. However, in the presence of organic solvents, PCBs may leach rapidly through the soil. Volatilization of PCBs from soil may be slow, but over time may be significant. **Disposal:** Approved PCB disposal methods include: incineration with scrubbing, high-efficiency boilers, landfills, and EPA-approved alternative disposal methods. Each disposal method has various criteria. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**EPA Designations**

RCRA Hazardous Waste (40 CFR 261.33): Not listed  
SARA Extremely Hazardous Substance (40 CFR 355): Not listed  
Listed as a SARA Toxic Chemical (40 CFR 372.65)  
Listed as a CERCLA Hazardous Substance\* (40 CFR 302.4): Final Reportable Quantity (RQ), 1 lb (0.454 kg) [\* per CWA, Sec. 311(b)(4) and 307(a)]

**OSHA Designations**

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

**Section 8. Special Protection Data**

**Goggles:** Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. Select respirator based on its suitability to provide adequate worker protection for given working conditions, level of airborne contamination, and presence of sufficient oxygen. Minimum respiratory protection should include a combination dust-fume-mist and organic vapor cartridge or canister or air-supplied, depending upon the situation. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.** If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent all skin contact. Butyl rubber, neoprene, Teflon, and fluorocarbon rubber have break through times greater than 8 hrs. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.<sup>(103)</sup> **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Segregate contaminated clothing in such a manner so that there is no direct contact by laundry personnel. Implement quality assurance to ascertain the completeness of the cleaning procedures. Remove this material from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Section 9. Special Precautions and Comments**

**Storage Requirements:** Store in a closed, labelled, container in a ventilated area with appropriate air pollution control equipment. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. **Administrative Controls:** Inform employees of the adverse health effects associated with PCBs. Limit access to PCB work areas to authorized personnel. Consider preplacement and periodic medical examinations with emphasis on the skin, liver, lung, and reproductive system. Monitor PCB blood levels. Consider possible effects on the fetus. Keep medical records for the entire length of employment and for the following 30 yrs.

**Transportation Data (49 CFR 172.101)**

DOT Shipping Name: Polychlorinated biphenyls  
DOT Hazard Class: 9  
ID No.: UN2315  
DOT Packing Group: II  
DOT Label: CLASS 9  
Special Provisions (172.102): 9, N81

**Packaging Authorizations**  
a) Exceptions: 173.155  
b) Non-bulk Packaging: 173.202  
c) Bulk Packaging: 173.241

**Quantity Limitations**  
a) Passenger Aircraft or Railcar: 100 L  
b) Cargo Aircraft Only: 220 L  
**Vessel Stowage Requirements**  
a) Vessel Stowage: A  
b) Other: 34

**MSDS Collection References:** 26, 73, 89, 100, 101, 103, 124, 126, 127, 132, 133, 136, 163, 164, 168, 169, 174, 175, 180

**Prepared by:** MJ Wurth, BS; **Industrial Hygiene Review:** PA Roy MPH, CIH; **Medical Review:** AC Darlington, MD

Copyright © 1992 by Genium Publishing Corporation. Any commercial use or reproduction without the publisher's permission is prohibited. Judgments as to the suitability of information herein for the purchaser's purposes are the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



# Genium Publishing Corporation

1145 Catalyn Street  
Schenectady, NY 12303-1836 USA  
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 474  
Fuel Oil No. 6

Issued: 10/81

Revision: A, 11/90

## Section 1. Material Identification

Fuel Oil No. 6 Description: A high-viscosity residual oil. Used to power heavy units such as ships, trucks, and trains. A thick paste, fuel oil No. 6 is not usually used unless preheated to decrease its viscosity.  
Other Designations: CAS No. 68553-00-4, bunker C.  
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*<sup>(TM)</sup> for a suppliers list.

R 1  
I -  
S 2  
K 2

33

NFPA



HMIS

H 0

F 2

R 0

PPG\*

\* Sec. 8

Cautions: Fuel oil No. 6 is a respiratory irritant and central nervous system (CNS) depressant. It is a moderate fire hazard when exposed to heat or flame.

## Section 2. Ingredients and Occupational Exposure Limits

Fuel oil No. 6\*

1989 OSHA PEL  
None established

1990-91 ACGIH TLV  
None established

1988 NIOSH REL  
None established

1985-86 Toxicity Data†  
Rat, oral, LD<sub>50</sub>: 9 g/kg

\* A complex mixture of paraffinic, olefinic, naphthenic, and aromatic hydrocarbons, including polycyclic aromatic hydrocarbons. Sulfur content is <2.3%. A fuel oil No. 6 with low sulfur (0.2 and 1.2%) is commercially available.

† Monitor NIOSH, RTECS (HZ1800000), for future toxicity data.

## Section 3. Physical Data

Boiling Point: 500 °F (>260 °C)

Specific Gravity: ~0.966

Vapor Pressure: 0.2 mm Hg at 70 °F (21 °C)

Water Solubility: Insoluble

Viscosity: 36,000 centistoke at 100 °F (37.8 °C)

Appearance and Odor: Black liquid to heavy paste with a petroleum odor.

## Section 4. Fire and Explosion Data

Flash Point: 150 to 270 °F (66 to 132 °C)

Autoignition Temperature: 765 °F (407 °C)

LEL: 3.9% v/v

UEL: 20.1% v/v

Extinguishing Media: Use dry chemical, carbon dioxide, foam, water fog, or spray. Do not use a forced water spray directly on burning oil since this scatters the fire. Use a smothering technique to extinguish fire. Cool fire-exposed containers with water spray.

Unusual Fire or Explosion Hazards: Fuel oil No. 6 is an OSHA Class IIIA combustible liquid that exhibits "boil-over" characteristics.

Special Fire-fighting Procedures: Isolate hazard area and deny entry. Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode and full protective clothing. If feasible, remove containers from fire hazard area. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

## Section 5. Reactivity Data

Stability/Polymerization: Fuel oil No. 6 is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.

Chemical Incompatibilities: Incompatible with strong oxidizing agents; heating greatly increases fire hazard.

Conditions to Avoid: Avoid heat and ignition sources.

Hazardous Products of Decomposition: Thermal oxidative decomposition of fuel oil No. 6 can produce various hydrocarbons and hydrocarbon derivatives and partial oxidation products including carbon dioxide, carbon monoxide, and sulfur dioxide.

## Section 6. Health Hazard Data

**Carcinogenicity:** The IARC lists fuel oils, residual (heavy) as possible human carcinogen (Group 2B); animal evidence-limited. Summary of Risks: Residual oils are generally more viscous and less toxic than kerosene due to their low volatility and limited absorption through the intestinal tract. Inhalation of heated or misted fuel oil No. 6 can cause the same systemic and local pulmonary effects seen with lighter grade fuel oils, respiratory tract irritation, headache, dizziness, nausea, stupor, convulsions, or unconsciousness, depending on concentration and time of exposure. When removed from exposure area, affected persons usually experience complete recovery. The residual (heavy) oils have a lower aspiration hazard since heavy oils are more viscous. Aspiration is limited to inhalation from vomiting after ingestion and dilution with gastric contents. Significant ingestion is unlikely. In addition, intestinal absorption of long-chain hydrocarbons is low. Its primary toxicities, then, are its laxative effect, mild gastrointestinal (GI) irritation, and skin irritation. After prolonged skin contact, changes in rabbit bladder linings are reported. Prolonged or repeated skin contact may cause irritation and block the sebaceous glands, with a rash of acne-like pimples and spots, usually on the arms and legs. Repeated prolonged dermal contact may also have systemic effects. Heavy repeated application of fuel oil No. 6 to rabbit skin gave severe skin changes and systemic toxicity including an increased incidence of hyperplasia of the urinary bladder epithelium.\*

**Medical Conditions Aggravated by Long-Term Exposure:** None reported.

**Target Organs:** Central nervous system (CNS), skin, and mucous membranes.

**Primary Entry Routes:** Inhalation, ingestion.

**Acute Effects:** Systemic effects from ingestion include gastrointestinal (GI) irritation, vomiting, diarrhea, and in severe cases, CNS depression, progressing to coma and death. Inhalation of aerosol or mists may result in increased rate of respiration, tachycardia (excessively rapid heart beat), and cyanosis (dark purplish coloration of the skin and mucous membranes caused by deficient oxygenation of the blood).

**Chronic Effects:** Repeated skin contact causes dermatitis and possible systemic toxicity.

### FIRST AID

**Eyes:** Gently lift the eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult a physician immediately.

**Skin:** Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. For reddened or blistered skin, consult a physician. Wash affected area with soap and water.

**Inhalation:** Remove exposed person to fresh air and support breathing as needed.

**Ingestion:** Never give anything by mouth to an unconscious or convulsing person. If ingested, *do not induce vomiting*. Consulting a physician immediately.

**After first aid, get appropriate in-plant, paramedic, or community medical support.**

**Note to Physicians:** Gastric lavage is contraindicated due to aspiration hazard. Preferred antidotes are charcoal and milk.

\* EPA (TOSCA) document 8EHQ-0181-0377, December, 1980.

## Section 7. Spill, Leak, and Disposal Procedures

**Spill/Leak:** Notify safety personnel, evacuate area for large spills, remove all heat and ignition sources, and provide maximum explosion-proof ventilation. Cleanup personnel should protect against vapor inhalation and liquid contact. Clean up spills promptly to reduce fire or vapor hazards. Use a noncombustible absorbent material to pick up small spills or residues. For large spills, dike far ahead to contain. Pick up liquid for reclaim or disposal. Do not release to sewers or waterways due to health and fire and/or explosion hazard. Follow applicable OSHA regulations (29 CFR 1910.120). Report large oil spills.

**Disposal:** Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**EPA Designations**

RCRA Hazardous Waste (40 CFR 261.33): Not listed

CERCLA Hazardous Substance (40 CFR 302.4): Not listed

SARA Extremely Hazardous Substance (40 CFR 355): Not listed

SARA Toxic Chemical (40 CFR 372.65): Not listed

**OSHA Designations**

Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

## Section 8. Special Protection Data

**Goggles:** Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).

**Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, use a NIOSH-approved respirator with mist filter and organic vapor cartridge. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.*

**Other:** Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.

**Ventilation:** Provide general and local explosion-proof ventilation systems to maintain airborne concentrations that promote worker safety and productivity. Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.<sup>(105)</sup>

**Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.

**Contaminated Equipment:** Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.

**Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

## Section 9. Special Precautions and Comments

**Storage Requirements:** Use and storage conditions should be suitable for an OSHA Class IIIA combustible liquid. Store in closed containers in a well-ventilated area away from heat and ignition sources and strong oxidizing agents. Protect containers from physical damage. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Use nonsparking tools and explosion-proof electrical equipment. No smoking in area of storage or use.

**Engineering Controls:** Avoid prolonged skin contact and vapor or mist inhalation. Use only in a well-ventilated area with personal protective gear. Institute a respiratory protection program that includes regular training, maintenance, inspection, and evaluation. Practice good personal hygiene and housekeeping procedures. Do not wear oil-contaminated clothing. Do not put oily rags in pockets. When working with this material, wear gloves or use barrier cream.

**Transportation Data (49 CFR 172.101)**

DOT Shipping Name: Fuel oil

DOT Hazard Class: Combustible liquid

ID No.: NA1993

DOT Label: None

DOT Packaging Exceptions: 173.118a

DOT Packaging Requirements: None

**MSDS Collection References:** 1, 6, 7, 12, 73, 84, 103, 126, 131, 132, 133, 136, 143

**Prepared by:** MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** W Silverman, MD; **Edited by:** JR Stuart, MS

98

**Section 1. Material Identification**

**Vinyl Chloride (C<sub>2</sub>H<sub>3</sub>Cl) Description:** Derived from ethylene dichloride and alcoholic potassium, by reaction of acetylene and hydrogen chloride (as gas or liquids), or by oxychlorination where ethylene reacts with hydrochloric acid and oxygen. Inhibitors such as butyl catechol, hydroquinone, or phenol are added to prevent polymerization. Used in the plastics industry for the production of polyvinyl chloride resins, in organic synthesis and formerly as a refrigerant, extraction solvent, and propellant (banned in 1974 because of its carcinogenic activity).

**Other Designations:** CAS No. 75-01-4, chloroethylene, chloroethene, ethylene monochloride, Trovidur, VC, VCM.

**Manufacturer:** Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*<sup>(73)</sup> for a suppliers list.

**Cautions:** Vinyl chloride is a confirmed human carcinogen. Vapor inhalation leads to central nervous system (CNS) depression. The liquid can cause frostbite. It is a flammable gas at room temperature and polymerizes on exposure to air or sunlight. Avoid exposure to VC through engineering controls and wearing PPE

R 2  
I 4  
S 4  
K 4

NFPA  
4  
4  
2

HMS  
H 3\*  
F 4  
R 2  
PPE - Sec. 8  
\* Chronic effects

**Section 2. Ingredients and Occupational Exposure Limits**

Vinyl Chloride, ca 98 to 99%. Impurities include water, acetaldehyde, hydrogen chloride, hydrogen peroxide, methyl chloride, butane, 1,3-butadiene, chlorophene, diacetylene, vinyl acetylene, and propene.

**1991 OSHA PELs**

8-hr TWA: 1 ppm

Ceiling: 5 ppm; OSHA-X

**1992-93 ACGIH TLV**

TWA: 5 ppm (13 mg/m<sup>3</sup>)

TLV-A1

**1985-86 Toxicity Data†**

Man, inhalation, TC<sub>Lo</sub>: Intermittent exposure to 200 ppm for 14 yr caused liver tumors.

Man, inhalation, TC<sub>Lo</sub>: 30 mg/m<sup>3</sup>/5 yr caused spermatogenesis.

Human, inhalation, TC: Continuous exposure to 300 mg/m<sup>3</sup> for an undetermined number of weeks caused blood tumors.

Rat, oral, LD<sub>50</sub>: 500 mg/kg; toxic effects not yet reviewed

**1990 NIOSH REL**

NIOSH-X

**1990 DFG (Germany) TRK\***

Existing Installations: 3 ppm

MAK-A1

\* TRK (technical exposure limit) is used in place of MAK when a material is a carcinogen. Unlike an MAK below which no adverse effects are expected, the TRK is a limit set below which adverse effects may still occur. This is based on the theory that 1 molecule of a carcinogenic substance may still produce a tumor. The TRK is set to allow for an acceptable risk (for example, 1 tumor in 1 million persons may be an acceptable risk).

† See NIOSH, *RTECS* (KU9625000), for additional mutation, reproductive, tumorigenic, and toxicity data.

**Section 3. Physical Data**

**Boiling Point:** 7 °F (-13.9 °C)

**Freezing Point:** -245 °F (-159.7 °C)

**Molecular Weight:** 62.5

**Specific Gravity:** 0.9106 at 68 °F (20 °C)

**Ionization Potential:** 9.99 eV

**Refraction Index:** 1.370 at 20 °C/D

**Surface Tension:** 23.1 dyne/cm at -4 °F (-20 °C)

**Odor Threshold:** 2000 to 5000 ppm\*

**Vapor Density (Air = 1):** 2.155

**Water Solubility:** Slightly soluble, 0.1% at 77 °F (25 °C)

**Other Solubilities:** alcohol, benzene, carbon tetrachloride, ether, hydrocarbon and oils.

**Vapor Pressure:** 2530 mm Hg at 68 °F (20 °C), 400 mm Hg at -18.4 °F (-28 °C)

**Critical Temperature:** 304.7 °F (151.5 °C)

**Critical Pressure:** 56.8 atm

**Viscosity:** 0.01072 cP at 68 °F (20 °C), gas; 0.28 cP at -4 °F (-20 °C), liquid

**Appearance and Odor:** A gas at room temperature. Usually found as a compressed/cooled liquid. The colorless liquid forms a vapor with a pleasant ethereal odor.

\*The actual vapor concentration that can be detected by humans has not been adequately determined and varies from one individual to another, from impurities, and probably from exposure duration. The odor threshold is not an accurate warning of exposure.

**Section 4. Fire and Explosion Data**

**Flash Point:** -108.4 °F (-78 °C) OC

**Autoignition Temperature:** 882 °F (472 °C)

**LEL:** 3.6% v/v

**UEL:** 33% v/v

**Extinguishing Media:** For small fires, use dry chemical or carbon dioxide. For large fires, use water spray, fog, or regular foam. **Unusual Fire or Explosion Hazards:** Large fires can be practically inextinguishable. Vapors may travel to an ignition source and flash back. VC may polymerize in cylinders or tank cars and explode in heat of fire. Vapors pose an explosion hazard indoors, outdoors, and in sewers. VC decomposes in fire to hydrogen chloride, carbon monoxide, carbon dioxide, and phosgene. Burning rate = 4.3 mm/min. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Stop gas leak if possible. Let tank, tank car, or tank truck burn unless leak can be stopped. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if this is impossible, withdraw from area and let fire burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire. *Do not* release runoff from fire control methods to sewers or waterways.

**Section 5. Reactivity Data**

**Stability/Polymerization:** Long term exposure to air may result in formation of peroxides which initiates explosive polymerization of the chloride. VC can polymerize on exposure to light or in presence of a catalyst. **Chemical Incompatibilities:** VC can explode on contact with oxide of nitrogen, may liberate hydrogen chloride on exposure to strong alkalis, and is incompatible with copper, oxidizers, aluminum, and peroxides. In the presence of moisture, VC attacks iron and steel. **Conditions to Avoid:** Exposure to sunlight, air, heat, and incompatibles. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of vinyl chloride can produce carbon oxides, and chloride gas.

**Section 6. Health Hazard Data**

**Carcinogenicity:** Vinyl chloride is listed as a carcinogen by the IARC (Class 1, *sufficient human evidence*)<sup>(164)</sup> NTP (Class 1, *sufficient human evidence*)<sup>(169)</sup> NIOSH (Class X, *carcinogen defined without further categorization*)<sup>(163)</sup> ACGIH (TLV-A1, *confirmed human carcinogen*)<sup>(163)</sup> DFG (MAK-A1, *capable of inducing malignant tumors in humans*)<sup>(163)</sup> and OSHA (Class X, *carcinogen defined without further categorization*)<sup>(164)</sup> Liver tumors (angiosarcomas) are confirmed from VC exposure. Other tumors of the CNS, respiratory system, blood, and lymphatic system have occurred from exposure to the polyvinyl chloride manufacture process but VC itself may not be the causative agent. **Summary of Risks:** Vapor inhalation causes varying degrees of CNS depression with noticeable anesthetic effects at levels of 1% (10,000 ppm). Studies have shown loss of libido and sperm in men exposed to VC and in Russian studies, 77% of exposed women experienced ovarian dysfunction, benign uterine growths, and prolapsed genital organs. However, no teratogenic effects have been seen in offspring of exposed workers.

Continue on next page

**Section 6. Health Hazard Data, continued**

ears that metabolism is necessary before many of VC's toxic effects occur. Some vinyl chloride is exhaled unchanged but most is metabolized to acetaldehyde. Skin absorption may occur if liquid is confined on skin but absorbed amount would be small. It is possible that the phenol inhibitor be absorbed as well. The compressed liquid can cause frostbite. Vapors are severely irritating to the eyes. Chronic exposure can cause cancer and a ad of syndromes known as *vinyl chloride disease*. Medical Conditions Aggravated by Long-Term Exposure: Liver, cardiac, pulmonary, and active tissue disorders. Target Organs: Liver, CNS, respiratory and lymphatic systems, bone, and connective tissue of the skin. Primary Entry es: Inhalation, skin/eye contact. Acute Effects: CNS effects include fatigue, headache, vertigo, ataxia, euphoria, visual disturbances, dulling of dry cues, numbness and tingling in the extremities, narcosis, unconsciousness, and death due to respiratory failure. Respiratory problems include spnea, asthma, and pneumoconiosis. Chronic Effects: Repeated exposure has lead to liver cancer; confirmed because of the otherwise rarity of its (angiosarcoma). Tumors in other organs have occurred in the polyvinyl chloride industry but agents other than VC may be responsible; authorities ill debating this issue. A triad of other effects are associated with VC exposure. Acro-osteolysis is associated with hand cleaning of polymerization ls and characterized by dissolution of bone in the hands, especially when associated with resorption. Raynaud's Phenomenon is a vascular disorder ked by recurrent spasm of the capillaries and especially those of the fingers and toes on exposure to cold. This is usually accompanied by pain and in vere cases may progress to local gangrene. Sclerodermatous skin changes (affecting the dorsal hands and distal forearms) are seen and described as a y progressive disease marked by deposition of fibrous connective tissue in the skin. The skin becomes thickened and raised nodules appear. algias (pain in one or more joints) and blood changes with decreased platelet number and capillary abnormalities may also occur.

**First Aid:** Eyes: Do not allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding mounts of water until transported to an emergency medical facility. Consult a physician immediately. Skin: Quickly remove contaminated clothing. with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician. frostbite, immerse affected area in 107.6 °F (42 °C) water until completely rewarmed. Do not use dry heat. Inhalation: Remove exposed person to air and support breathing as needed. Ingestion: Unlikely! VC is a gas above 7 °F (-14 °C). Note to Physicians: Endotracheal intubation may be quired if significant CNS or respiratory depression occur. Diagnostic test: thiodiglycolic acid in urine (normally < 2 mg/g creatinine).

**Section 7. Spill, Leak, and Disposal Procedures**

**Leak:** Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. If possible without risk, stop gas flow. Shut off ignition rces. Report any release > 1 lb. Follow applicable OSHA regulations (29 CFR 1910.120). **Environmental Transport:** VC reacts with hydroxyl dicals in the troposphere with a half-life of 1.2 days. The half-life = a few hr in photochemical smog. Reaction products in the air include chloro- ldehyde, hydrogen chloride, chloroethylene, epoxide, formaldehyde, formyl chloride, formic acid, and carbon monoxide. In soil, VC rapidly volatil- What does not evaporate will be highly mobile and may leach into groundwater. In water, VC is not expected to hydrolyze, bioconcentrate, or b to sediment. It will rapidly volatilize with an estimated half-life of 0.805 hr for evaporation from a river 1 meter deep with a current of 3 meter/sec and a wind velocity of 3 meter/sec. In waters containing photosensitizers such as humic acid, photodegradation will be rapid. Soil Absorption/Mobility: from an estimated solubility of 2,700 ppm, a Koc of 56 is established for VC which indicates high soil mobility and potential to leach into groundwater. osal: Dilute any waste compressed liquid to a 1% solution and remove phenol inhibitor as sodium. Pour onto vermiculite, sodium bicarbonate, or a & soda ash mixture (90/10). Add slaked lime if fluoride is present. Mix in paper boxes, place in incinerator, cover with scrap wood and paper, and ite with excelsior train. Another method is to dissolve waste in a flammable solvent and spray in incinerator firebox equipped with an afterburner and kali scrubber. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**Designations**

id as a RCRA Hazardous Waste (40 CFR 261.33): No. U043

id as an Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed

id as a SARA Toxic Chemical (40 CFR 372.65)

id as a CERCLA Hazardous Substance\* (40 CFR 302.4): Final Reportable Quantity (RQ), 1 lb (0.454 kg) [\* per CWA, Sec. 307 (a); CAA, Sec. & RCRA, Sec. 3001]

**OSHA Designations**

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

**Section 8. Special Protection Data**

**Goggles:** Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA 29 CFR 1910.134 and, if necessary, wear a MSHA/NIOSH-approved respirator. According to NIOSH<sup>(148)</sup>, for any detectable concentration use a SCBA supplied-air respirator with a full facepiece operated in pressure-demand or other positive pressure mode. See 29 CFR 1910.1017 for detailed OSHA respirator recommendations. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning! Air- purifying respirators do not protect workers in oxygen-deficient atmospheres.** If respirators are used, OSHA requires a written respiratory protection ram that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and enient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets made of Viton or chlorinated polyethylene to prevent skin contact. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PEL's (Sec. 10). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.<sup>(103)</sup> **Safety Stations:** e available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate : clothes from street clothes, launder before reuse and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Section 9. Special Precautions and Comments**

**Storage Requirements:** Store in a cool, dry, well-ventilated area in clearly labeled containers. Outside or detached storage is preferred. Large amounts uld be stored in steel containers under pressure. Keep separate from incompatibles (Sec. 5). Venting, under pressure should be safety relief. At atm, venting should be pressure vacuum. Regularly monitor inhibitor levels. To avoid static sparks, electrically ground and bond all equipment used with VC. Avoid open flames, spark formation and electric discharges around VC. **Engineering Controls:** To reduce potential health hazards, use sufficient tion or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. Install Class 1, Group D trical equipment. **Administrative Controls:** Inform VC exposed personnel of hazards associated with its use. Preplacement and periodic medical exams of workers exposed above the action level is mandatory under OSHA 29 CFR (1910.1017). Monitor for liver cancer, scleroderma, pneumonitis, clotting abnormalities, and acro-osteolysis.

**Transportation Data (49 CFR 172.101)**

**Shipping Name:** Vinyl Chloride

**Hazard Class:** 2.1

**ID No.:** UN1086

**DOT Packing Group:** --

**Label:** Flammable Gas

**Special Provisions (172.102):** B44

**Packaging Authorizations**

a) Exceptions: 173.306

b) Non-bulk Packaging: 173.304

c) Bulk Packaging: 173.314 & 173.315

**Quantity Limitations**

a) Passenger Aircraft or Railcar: Forbidden

b) Cargo Aircraft Only: 150 kg

**Vessel Stowage Requirements**

a) Vessel Stowage: B

b) Other: 40

**MSDS Collection References:** 26, 73, 100, 101, 103, 124, 126, 127, 132, 133, 136, 140, 148, 149, 153, 159, 162, 163, 164, 167, 168, 171, 174, 175

**Prepared by:** M Gannon, BA; **Industrial Hygiene Review:** PA Roy, MPH, CIH; **Medical Review:** AC Darlington, MPH, MD

right © 1992 by Genium Publishing Corporation. Any commercial use or reproduction without the publisher's permission is prohibited. Judgments as to the suitability of information herein for the purchaser's purposes are necessarily purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Publishing Corporation extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.





## Section 1. Material Identification

39

**Toluene ( $C_6H_5CH_3$ ) Description:** Derived from petroleum i.e., dehydrogenation of cycloparaffin fractions followed by the aromatization of saturated aromatic hydrocarbons or by fractional distillation of coal-tar light oil and purified by rectification. Used widely as a solvent (replacing benzene in many cases) for oils, resins, adhesives, natural rubber, coal tar, asphalt, pitch, acetyl celluloses, cellulose paints and varnishes; a diluent for photogravure inks, raw material for organic synthesis (benzoyl & benzilidene chlorides, saccharine, TNT, toluene diisocyanate, and many dyestuffs), in aviation and high octane automobile gasoline, as a nonclinical thermometer liquid and suspension solution for navigational instruments.

**Other Designations:** CAS No. 108-88-3, Methacide, methylbenzene, methylbenzol, phenylmethane, toluol, Tolu-sol.

**Manufacturer:** Contact your supplier or distributor. Consult latest *Chemical Week Buyers' Guide*<sup>(79)</sup> for a suppliers list.

R 1  
I 3  
S 2\*  
K 3  
\* Skin absorption

NFPA

HMIS  
H 2- Chronic effects  
F 3  
R 0  
PPE-Sec. 8

**Cautions:** Toluene is an eye, skin, and respiratory tract irritant becoming narcotic at high concentrations. Liver and kidney damage has occurred. Pregnant women chronically exposed to toluene have shown teratogenic effects. Toluene is highly flammable.

## Section 2. Ingredients and Occupational Exposure Limits

Toluene, < 100%; may contain a small amount of benzene (~ 1%), xylene, and nonaromatic hydrocarbons.

## 1991 OSHA PELs

8-hr TWA: 100 ppm (375 mg/m<sup>3</sup>)

15-min STEL: 150 ppm (560 mg/m<sup>3</sup>)

## 1990 IDLH Level

2000 ppm

## 1990 NIOSH RELs

TWA: 100 ppm (375 mg/m<sup>3</sup>)

STEL: 150 ppm (560 mg/m<sup>3</sup>)

## 1992-93 ACGIH TLV (Skin)

TWA: 50 ppm (188 mg/m<sup>3</sup>)

## 1990 DFG (Germany) MAK\*

TWA: 100 ppm (380 mg/m<sup>3</sup>)

Half-life: 2 hr to end of shift

Category II: Substances with systemic effects

Peak Exposure Limit: 500 ppm, 30 min

average value, 2/shift

## 1985-86 Toxicity Data†

Man, inhalation, TC<sub>Lo</sub>: 100 ppm caused hallucinations, and changes in motor activity and changes in psychophysiological tests.

Human, oral, LD<sub>50</sub>: 50 mg/kg; toxic effects not yet reviewed

Human, eye: 300 ppm caused irritation.

Rat, oral, LD<sub>50</sub>: 5000 mg/kg

Rat, liver: 30 µmol/L caused DNA damage.

\* Available information suggests damage to the developing fetus is probable.

†See NIOSH, RTECS (XS250000), for additional irritation, mutation, reproductive, and toxicity data.

## Section 3. Physical Data

Boiling Point: 232 °F (110.6 °C)

Melting Point: -139 °F (-95 °C)

Molecular Weight: 92.15

Density: 0.866 at 68 °F (20/4 °C)

Surface Tension: 29 dyne/cm at 68 °F (20 °C)

Viscosity: 0.59 cP at 68 °F (20 °C)

Refraction Index: 1.4967 at 20 °C/D

Water Solubility: Very slightly soluble, 0.6 mg/L at 68 °F (20 °C)

Other Solubilities: Soluble in acetone, alcohol, ether, benzene, chloroform, glacial acetic acid, petroleum ether, and carbon disulfide.

Vapor Pressure: 22 mm Hg at 68 °F (20 °C); 36.7 mm Hg at 86 °F (30 °C)

Saturated Vapor Density (Air = 0.075 lb/ft<sup>3</sup> or 1.2 kg/m<sup>3</sup>): 0.0797 lb/ft<sup>3</sup> or 1.2755 kg/m<sup>3</sup>

Odor Threshold (range of all referenced values): 0.021 to 69 ppm

**Appearance and Odor:** Colorless liquid with a sickly sweet odor.

## Section 4. Fire and Explosion Data

Flash Point: 40 °F (4.4 °C) CC

Autoignition Temperature: 896 °F (480 °C)

LEL: 1.27% v/v

UEL: 7.0% v/v

**Extinguishing Media:** Toluene is a Class 1B flammable liquid. To fight fire, use dry chemical carbon dioxide, or 'alcohol-resistant' foam. Water spray may be ineffective as toluene floats on water and may actually spread fire. **Unusual Fire or Explosion Hazards:** Concentrated vapors are heavier than air and may travel to an ignition source and flash back. Container may explode in heat of fire. Toluene's burning rate = 5.7 mm/min and its flame speed = 37 cm/sec. Vapor poses an explosion hazard indoors, outdoors, and in sewers. May accumulate static electricity. **Special Fire-fighting Procedures:** Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode. Structural firefighter's protective clothing provides only limited protection. Apply cooling water to sides of tanks until well after fire is out. Stay away from ends of tanks. For massive fire in cargo area, use monitor nozzles or unmanned hose holders; if impossible, withdraw from fire and let burn. Withdraw immediately if you hear a rising sound from venting safety device or notice any tank discoloration due to fire because a BLEVE (boiling liquid expanding vapor explosion) may be imminent. Do not release runoff from fire control methods to sewers or waterways.

## Section 5. Reactivity Data

**Stability/Polymerization:** Toluene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization can't occur. **Chemical Incompatibilities:** Strong oxidizers, concentrated nitric acid, nitric acid + sulfuric acid, dinitrogen tetroxide, silver perchlorate, bromine trifluoride, tetranitromethane, and 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione. **Conditions to Avoid:** Contact with heat, ignition sources, or incompatible. **Hazardous Products of Decomposition:** Thermal oxidative decomposition of toluene can produce carbon dioxide, and acid, irritating smoke.

## Section 6. Health Hazard Data

**Carcinogenicity:** The IARC,<sup>(164)</sup> NTP,<sup>(169)</sup> and OSHA<sup>(164)</sup> do not list toluene as a carcinogen. **Summary of Risks:** Toluene is irritating to the eyes, nose, and respiratory tract. Inhalation of high concentrations produces a narcotic effect sometimes leading to coma as well as liver and kidney damage. 93% of inhaled toluene is retained in the body of which 80% is metabolized to benzoic acid, then to hippuric acid and excreted in urine. The remainder is metabolized to o-cresol and excreted or exhaled unchanged. Toluene metabolism is inhibited by alcohol ingestion and is synergistic with benzene, asphalt fumes, or chlorinated hydrocarbons (i.e. perchloroethylene). Toluene is readily absorbed through the skin at 14 to 23 mg/cm<sup>2</sup>/hr. Toluene is absorbed quicker during exercise than at rest and appears to be retained longer in obese versus thin victims; presumably due to its lipid solubility. There is inconsistent data on toluene's ability to damage bone marrow; chronic poisoning has resulted in anemia and leucopenia with biopsy showing bone marrow hypo-plasia. These reports are few and some authorities argue that the effects may have been due to benzene contaminants. Chronic inhalation during pregnancy has been associated with teratogenic effects on the fetus including microcephaly, CNS dysfunction, attentional deficits, developmental delay + language impairment, growth retardation, and physical defects including a small midface, short palpebral fissures, with deep-set eyes, low-set ears, flat nasal bridge with a small nose, micrognathia, and blunt fingertips. There is some evidence that toluene causes an autoimmune illness in which the body produces antibodies that cause inflammation of its own kidney.

Continue on next page

**Section 6. Health Hazard Data**

**Medical Conditions Aggravated by Long-Term Exposure:** Alcoholism and CNS, kidney, skin, or liver disease. **Target Organs:** CNS, liver, kidney, skin. **Primary Entry Routes:** Inhalation, skin contact/absorption. **Acute Effects:** Vapor inhalation causes respiratory tract irritation, fatigue, weakness, confusion, dizziness, headache, dilated pupils, watering eyes, nervousness, insomnia, parasthesia, and vertigo progressing to narcotic coma. Death may result from cardiac arrest due to ventricular fibrillation with catecholamines loss. Liquid splashed in the eye causes conjunctival irritation, transient corneal damage and possible burns. Prolonged skin contact leads to drying and fissured dermatitis. Ingestion causes GI tract irritation and symptoms associated with inhalation. **Chronic Effects:** Symptoms include mucous membrane irritation, headache, vertigo, nausea, appetite loss and alcohol intolerance. Repeated heavy exposure may result in encephalopathies (cerebellar ataxia and cognitive dysfunction), liver enlargement, and kidney dystrophy (wasting away). Symptoms usually appear at workdays end, worsen at weeks end and decrease or disappear over the weekend.

**FIRST AID** **Eyes:** Do not allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water until transported to an emergency medical facility. Consult an ophthalmologist immediately. **Skin:** Quickly remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. **Inhalation:** Remove exposed person to fresh air and support breathing as needed. **Ingestion:** Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center and unless otherwise advised, have that conscious and alert person drink 1 to 2 glasses of water to dilute. Do not induce vomiting because of danger of aspiration into the lungs. Gastric lavage may be indicated if large amounts are swallowed; potential toxicity needs to be weighed against aspiration risk when deciding for or against gastric lavage. **Note to Physicians:** Monitor cardiac function. If indicated, use epinephrine and other catecholamines carefully, because of the possibility of a lowered myocardial threshold to the arrhythmogenic effects of such substances. Obtain CBC, electrolytes, and urinalysis. Monitor arterial blood gases. If toluene has > 0.02% (200 ppm) benzene, evaluate for potential benzene toxicity. BEI: Hippuric acid in urine, sample at shift end (2.5 g/g creatinine); Toluene in venous blood, sample at shift end (1.0 mg/L).

**Section 7. Spill, Leak, and Disposal Procedures**

**Spill/Leak:** Notify safety personnel, isolate and ventilate area, deny entry, and stay upwind. Cleanup personnel protect against inhalation and skin/eye contact. Use water spray to cool and disperse vapors but it may not prevent ignition in closed spaces. Cellosolve, hycar absorbent materials, and fluorocarbon water can also be used for vapor suppression/containment. Take up small spill with earth, sand, vermiculite, or other absorbent, noncombustible material. Dike far ahead of large spills for later reclamation or disposal. For water spills, (10 ppm or greater) apply activated carbon at 10X the spilled amount and remove trapped material with suction hoses or use mechanical dredges/lifts to remove immobilized masses of pollutants and precipitates. Toluene can undergo fluidized bed incineration at 842 to 1796 °F (450 to 980 °C), rotary kiln incineration at 1508 to 2912 °F (820 to 600 °C), or liquid injection incineration at 1202 to 2912 °F (650 to 1600 °C). Follow applicable OSHA regulations (29 CFR 1910.120). **Ecotoxicity** **Values:** Blue gill, LC<sub>50</sub> = 17 mg/L/24 hr; shrimp (*Crangonfraxis coron*), LC<sub>50</sub> = 4.3 ppm/96 hr; fathead minnow (*Pimephales promelas*), LC<sub>50</sub> = 36.2 mg/L/96 hr. **Environmental Degradation:** If released to land, toluene evaporates and undergoes microbial degradation. In water, toluene volatilizes and biodegrades with a half-life of days to several weeks. In air, toluene degrades by reaction with photochemically produced hydroxyl radicals.

**Disposal:** Treat contaminated water by gravity separation of solids, followed by skimming of surface. Pass through dual media filtration and carbon absorption units (carbon ratio 1 kg to 10 kg soluble material). Return waste water from backwash to gravity separator. Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

**EPA Designations**

Listed as a RCRA Hazardous Waste (40 CFR 261.33): No. U220

SARA Extremely Hazardous Substance (40 CFR 355), TPQ: Not listed

Listed as a CERCLA Hazardous Substance\* (40 CFR 302.4): Final Reportable Quantity (RQ), 1000 lb (454 kg)

[\* per RCRA, Sec. 3001; CWA, Sec. 311 (b)(4); CWA, Sec. 307 (a)]

Listed as a SARA Toxic Chemical (40 CFR 372.65): Not listed

**OSHA Designations**

Listed as an Air Contaminant (29 CFR 1910.1000, Table Z-1-A)

**Section 8. Special Protection Data**

**Goggles:** Wear protective eyeglasses with shatter-resistant glass and side-shields or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Because contact lens use in industry is controversial, establish your own policy. **Respirator:** Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For < 100 ppm, use any chemical cartridge respirator with appropriate organic vapor cartridges, any supplied-air respirator (SAR), or SCBA. For < 200 ppm, use any SAR operated in continuous-flow mode, any SAR or SCBA with a full facepiece, or any air-purifying respirator with a full facepiece having a chin-style, front or back mounted organic vapor canister. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA. **Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.** If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas. **Other:** Wear chemically protective gloves, boots, aprons, and gauntlets to prevent skin contact. Polyvinyl alcohol with a breakthrough time of > 8 hr, Teflon and Viton are recommended as suitable materials for PPE. **Ventilation:** Provide general and local exhaust ventilation systems to maintain airborne concentrations below the OSHA PELs (Sec. 2). Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.<sup>(103)</sup> **Safety Stations:** Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities. **Contaminated Equipment:** Separate contaminated work clothes from street clothes and launder before reuse. Remove toluene from your shoes and clean PPE. **Comments:** Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

**Section 9. Special Precautions and Comments**

**Storage Requirements:** Prevent physical damage to containers. Store in a cool, dry, well-ventilated area away from ignition sources and incompatible materials. Outside or detached storage is preferred. If stored inside, use a standard flammable liquids warehouse, room, or cabinet. To prevent static sparks, electrically ground and bond all equipment used with toluene. Do not use open lights in toluene areas. Install Class 1, Group D electrical equipment. Check that toluene is free of or contains < 1% benzene before use. **Engineering Controls:** To reduce potential health hazards, use sufficient dilution or local exhaust ventilation to control airborne contaminants and to maintain concentrations at the lowest practical level. **Administrative Controls:** Adopt controls for confined spaces (29 CFR 1910.146) if entering areas of unknown toluene levels (holes, wells, storage tanks). Consider preplacement and periodic medical exams of exposed workers that emphasize the CNS, liver, kidney, and skin. Include hemocytometric and thrombocyte count in cases where benzene is a contaminant of toluene. Monitor air at regular intervals to ensure effective ventilation.

**Transportation Data (49 CFR 172.101)**

<b>DOT Shipping Name:</b> Toluene	<b>Packaging Authorizations</b>	<b>Quantity Limitations</b>	<b>Vessel Stowage Requirements</b>
<b>DOT Hazard Class:</b> 3	a) Exceptions: 150	a) Passenger Aircraft or Railcar: 5L	<b>Vessel Stowage:</b> B
<b>ID No.:</b> UN1294	b) Non-bulk Packaging: 202	b) Cargo Aircraft Only: 60L	<b>Other:</b> --
<b>DOT Packing Group:</b> II	c) Bulk Packaging: 242		
<b>DOT Label:</b> Flammable Liquid			
<b>Special Provisions (172.102):</b> T1			

MSDS Collection References: 26, 73, 100, 101, 103, 124, 126, 127, 132, 140, 148, 153, 159, 163, 164, 167, 169, 171, 174, 175, 176, 180.

Prepared by: M Gannon, BA; Industrial Hygiene Review: PA Roy, CIH, MPH; Medical Review: AC Darlington, MD, MPH



D

***APPENDIX D***  
***SITE-SPECIFIC PERSONAL PROTECTIVE***  
***EQUIPMENT (PPE) PROGRAM***

---



OHM Remediation  
Services Corp.

## HEALTH & SAFETY PROCEDURES

### PERSONAL PROTECTIVE EQUIPMENT PROGRAM

PROCEDURE NUMBER 4-1

Page 1 of 10

LAST REVISED 5/96

APPROVED BY: DLM/FHH

#### 1.0 OBJECTIVE

OHM Remediation Services Corp. (OHM) personnel will be protected for chemical, physical, and environmental hazards by the appropriate personal protective equipment (PPE) when engineering and administrative controls are not effective in controlling job hazards.

#### 2.0 PURPOSE

The purpose of this procedure is to address the elements of the PPE program. This PPE program conforms to the requirements found in 29 CFR 1910.120 (g) Engineering controls, work practices, and personal protective equipment for employee protection; 29 CFR 1910 Subpart I - Personal Protective Equipment - .132 General Requirements, .133 Eye and Face Protection, .135 Head Protection, .136 Foot Protection, .138 Hand Protection; and 29 CFR 1910.1200 Hazard Communication.

#### 3.0 RESPONSIBILITY AND AUTHORITY

The responsibility and authority for the selection, use, and maintenance of personal protective equipment is shared between management, supervisory, health and safety, and employee personnel.

- 3.1 Management. Management has the responsibility to provide PPE appropriate for the hazards associated with expected work tasks.
- 3.2 Supervisors. Supervisors have the responsibility to conduct hazard assessments and to ensure personnel utilize PPE in compliance with this SOP. Supervisors may request assistance from or designate authority to health and safety personnel for hazard assessment, selection, inspection, and decontamination of PPE. The supervisor must use PPE specified by the regional health and safety director or designee or as specified in the health and safety plan (HASP). The use of PPE by employees is the supervisor's responsibility.
- 3.3 Health and Safety Personnel. Health and safety personnel have the responsibility to assist supervisors in the ongoing hazard assessment, selection, inspection, and decontamination of PPE. In the event of conflict, health and safety personnel have the authority to implement the necessary measures.
- 3.4 Employees. Employees have the responsibility to use, inspect, and decontaminate PPE as directed by supervisors.

#### 4.0 PROGRAM ELEMENTS

Program elements define the regulatory requirements of a PPE program.

4.1 Hazard Assessment. All tasks undertaken by OHM personnel will be assessed for chemical, physical, and environmental hazards present or likely to be present which necessitate the use of PPE to ensure adequate protection. This assessment shall take place prior to commencement of work.

4.2 Hazard Reassessment. The level of protection or type of personal protective equipment shall be increased when additional information on site conditions indicates that increased protection is necessary to reduce employee exposures below permissible exposure limits, published exposure levels for hazardous substances and health hazards, or other physical and environmental hazards.

4.3 PPE Selection. The regional health and safety director or designee will initially select the level and types of PPE that will protect the affected employee from the hazards identified in the initial hazard assessment.

On a periodic basis, the corporate director of health and safety, will establish specifications for commonly used PPE and review submissions for blanket order PPE suppliers. PPE items should be procured only from these approved vendors. A list of specifications and approved vendors is available through corporate or regional health and safety department or corporate or regional purchasing department.

4.4 Written Certification. The site specific health and safety plan (HASP) will serve as the written certification that identifies the workplace was evaluated. The HASP shall be dated. The signature line shall designate the person certifying that the evaluation has been performed.

4.5 Communication of Selection. Employees will be informed of the PPE selection decisions through reading or verbally reviewing the HASP, attending pre-project safety briefings, job safety analysis (JSA) review, or attending safety meetings.

4.6 PPE Use and Fit. The supervisor will be responsible for the proper use and fit of PPE by workers under their direction and will monitor the effectiveness of these items. Health and safety personnel will advise and assist the supervisor in these areas.

4.7 Work Mission Duration. The supervisor will be responsible for the establishment of the duration of specific work missions. The duration will be determined by the complexity of the assignment, PPE involved, physical factors, temperature,

humidity, weather conditions, elevation of work, and acclimation of the worker to the demands of the task assigned. The supervisor will consider the recommendations of the health and safety personnel.

A sufficient amount of rest breaks will be allowed in order to avoid overexertion or thermal stress by the employees while maintaining productive work practices. Further guidance is offered in OHM SOP 3-4, Heat Stress Prevention and SOP 3-5, Cold Stress Prevention.

- 4.8 PPE Maintenance and Storage. Each employee is responsible for the proper maintenance and storage of the standard issue equipment (e.g., hard hat, full-face piece air purifying respirator, safety glasses). The supervisor will assure that proper maintenance is carried out.

- 4.9 PPE Decontamination. Each employee is responsible for daily cleaning and decontamination of reusable PPE such as outer gloves, outer boots, reusable chemically resistant clothing, and standard issue PPE such as hard hats and respirators.

OHM will provide an area for decontamination operations, necessary cleaning agents, cleaning tools, such as brushes and wash basins, and a method to dispose of materials generated during decontamination activities.

OHM will attempt to reduce decontamination requirements through the use of disposable protective clothing and gloves as feasible.

- 4.10 PPE Training. All employees will receive training in the proper use of PPE prior to wearing the equipment in a work situation. This training will be administered upon commencement of employment during HAZWOPER training. PPE refresher training will be reviewed annually during the HAZWOPER refresher training. Project specific training will be provided as required.

- 4.11 PPE Donning and Doffing Procedures. All employees will receive training upon commencement of employment and during annual refresher training concerning the donning and doffing of PPE. Periodic training will be provided as required.

- 4.12 PPE Inspection. Each employee shall inspect PPE for defects and proper function prior to each use. Defective or damaged PPE shall not be used. Any PPE found to be defective or have missing parts will be replaced prior to use.

- 4.13 PPE In Use Monitoring. The supervisor is responsible for monitoring the effectiveness of selected PPE. If at any time level of PPE is to be downgraded, it is mandatory that the change be approved by the regional health and safety director or designee.

- 4.14 Evaluation of PPE Program. Health and safety personnel will compile data on PPE in the field to determine that the PPE performs to OHM needs. Periodically, this information should be reviewed cognizant by a health and safety professional during site audits or weekly supervisors inspections to ensure that PPE is providing the necessary level of protection, quality, and is appropriate for the work performed.

If at any time the failure of PPE causes injury to an employee or fails to perform as expected, the supervisor will take the unit or item out of service and investigate the incident. The incident shall be immediately reported to the regional health and safety director. If after scrutiny, the unit or item is determined to have a manufacturing defect, all identical units will be removed from use until corrective actions are taken.

- 4.15 Limitations During Temperature Extremes. Extreme temperatures exert stress on personnel and may alter the performance characteristics of PPE. During periods of extreme temperature, work assignments will be adjusted to protect the employee from overexertion or exposure. The supervisor will evaluate if temperature extremes are effecting performance characteristics of PPE and report these findings to the regional health and safety director.

- 4.16 Unserviceable PPE. Any PPE which is no longer functioning properly or is no longer serviceable shall be removed from use and either repaired or destroyed.

## 5.0 SAFETY EQUIPMENT POLICY

OHM will provide, maintain, and replace personal protective equipment as detailed below.

- 5.1 Standard Issue Safety Equipment. Standard issue safety equipment will be provided at no cost to field employees. These items consist of:

- Hard hat
- Safety glasses with clear and shaded lenses
- Full-face respirator with nose cup
- Regional approved OHM designed shirts

- 5.2 Company Provided Equipment. OHM will provide, at no cost to the employee the following items on a task specific or project specific basis:

- Chemical protective equipment such as gloves, boots, and clothing
- Specialty glasses or goggles

- Face shields
- Flame resistant clothing
- Hearing protection
- Fall protection

5.3 Employee Provided Equipment. The employee shall provide the following equipment:

- ANSI approved steel toed and shank boots/shoes (Note: Further guidance is provided in Section 9, Safety Footwear)
- Outerwear for cold weather

5.4 Equipment Replacement. OHM will replace worn-out or work-damaged equipment detailed in Sections 5.1 and 5.2. OHM reserves the right to charge employees for the replacement cost of equipment which is lost or damaged through neglect or abuse.

5.5 Additional PPE. The regional health and safety director or the supervisor may require additional company provided PPE on a task specific basis.

## 6.0 WORK CLOTHES

OHM employees, subcontractors, and visitors will observe the requirements for proper work clothing when on OHM project sites, facilities, and shops.

6.1 Pants. Long pants are required at all times. These pants must be in good repair.

6.2 Shirts. Shirts will be worn on the job. Shirts will be buttoned up the front and at the cuff unless rolled up. Shirt tails must be kept in the trousers. Sleeveless shirts are prohibited at all work locations. Supervisory personnel are expected to wear a shirt with a collar. T-shirts are permitted for personnel who wear protective clothing most of the day.

6.3 Clothing. Loose or ragged clothing will not be worn.

6.4 Modifications. Regional health and safety director may modify work clothing requirements on a project specific basis.

6.5 Contaminated Clothing. Clothing (including shoes) saturated with petroleum products or chemicals will be removed immediately to prevent irritation and

possible dermal exposure.

- 6.6 Jewelry. Rings and other jewelry (except watches) must be removed when working in areas where they could catch on moving objects, sharp protrusions, come in contact with electrical circuits or chemical agents, or compromise PPE (i.e. rings capable of cutting gloves). Additionally, the supervisor may deem other types of jewelry inappropriate for the work task.
- 6.7 Hair Length. Hair long enough to constitute a hazard while working around moving machinery or rotating tools and equipment must be secured by a net or tied back. Hair styles must not interfere with the ability to properly wear safety headgear, safety spectacles, and respiratory protection.

## 7.0 EYE/FACE PROTECTION

All OHM employees, subcontractors, and visitors shall wear eye and face protection meeting the requirements of ANSI document Z87.1 - 1989 titled "Practice of Occupational and Educational Eye and Face Protection" during the tasks posing exposure to eye or face injury.

- 7.1 Requirements. To protect the face and eyes against injuries from flying objects, splashing liquids, and harmful rays, safety spectacles with side shields, goggles, face shields, cutting goggles, and welding helmets will be used as appropriate. The supervisor will be responsible to identify the need for eye/face protection and specify the eye/face protection required for each operation. A selection guide is attached in Table 1.
- 7.2 Safety Spectacles. Safety spectacles with side shields are protective devices intended to shield the wearer's eyes from a variety of hazards. While they are primary protectors and may be used alone, they may also be used in conjunction with other protective devices such as goggles and face shields.
- 7.3 Goggles. Goggles are protective devices intended to fit the face immediately surrounding the eyes in order to shield the eyes from a variety of hazards. While they are primary protectors and may be used alone, they also may be used in conjunction with other protectors.
- 7.4 Face Shields. Face shields are protective devices intended to shield the wearer's face, or portions thereof, in addition to the eyes, from certain hazards. Face shields are secondary protectors and shall not be used in place of safety glasses, tight fitting goggles, or other primary protective devices.



- 7.5 Cutting Goggles. Cutting goggles are protective devices designed to protect the eyes from radiation and impact. Goggles are primary protectors and in some situations must be supplemented with face shields. See Table 2 for selection guidelines.
- 7.6 Welding Helmets. Welding helmets are protective devices intended to shield the eyes and face from optical radiation and impact. Welding helmets are secondary protectors and shall be used only in conjunction with primary protectors such as safety spectacles or goggles. See Table 3 for selection guidelines.
- 7.7 Prescription Spectacles. For personnel that wear prescription spectacles, OHM provides prescription safety spectacles with side shields. It is mandatory that prescription safety spectacles not be altered by the employee and be worn at all times when safety spectacles are required. Refer to SOP 4-4, Prescription Safety Glasses.
- 7.8 Contact Lenses. Contact lenses are not permitted to be worn where accidental eye contact with chemical agents or physical materials is possible. OHM provides prescription spectacles and other protective devices for use in these situations.
- 7.9 Shaded Lenses. Shaded lenses are not to be worn indoors or under low light conditions.
- 7.10 Modifications. Eye/face protection may not be altered or modified in any manner. For example, removing side shields on safety glasses.

## 8.0 SAFETY HEADGEAR

All OHM employees, subcontractors, and visitors shall wear safety headgear meeting the requirements of ANSI document Z89.1-1986 titled "Protective Headwear for Industrial Workers - Requirements" when exposed to overhead hazards.

- 8.1 Requirement. Safety headgear shall be worn by all personnel while engaged in work where there is a hazard of falling objects, low overhead restrictions, and other overhead hazards exist. Safety headgear may also be required to be worn by contractual requirements.
- 8.2 Use. Safety headgear must be worn as prescribed by the manufacturer in the bill front position unless the headgear was approved to be worn in another position.
- 8.3 Modifications. Safety headgear shall not be painted, drilled or modified in any manner. Use of safety related headgear stickers are permitted.
- 8.4 Life Expectancy. No maximum mandatory service life is specified by regulation for safety headgear. However, a hard hat should be removed from service if

chemical corrosion, cracks, deformities, worn suspension, or discoloration is noted with the unit.

## 9.0 SAFETY FOOTWEAR

All OHM employees, subcontractors, and visitors that enter OHM project sites and are exposed to foot hazards shall wear footwear meeting the ANSI document Z41 - 1991 titled "Protective Footwear" during operations posing foot injury.

9.1 Project Sites. Steel toe leather work boots shall be worn on all OHM project sites. High top or low top sneakers, western style boots with a riding heel, or other footwear even though ANSI approved are not appropriate for the activities encountered at hazardous waste and emergency response sites and shall not be worn. The HASP will address additional safety footwear requirements for a particular project.

9.2 OHM Facilities and Shops. Personnel working at OHM shops and facilities have the option of wearing other types of ANSI approved safety work shoes and boots provided they are appropriate for the tasks being performed. The supervisor of the work area is responsible to decide what type footwear is appropriate.

## 10.0 HAND PROTECTION/GLOVES

OHM employees, subcontractors, and visitors will don appropriate gloves when engaged in any operation that presents a hazard to the hands.

10.1 Use. Appropriate work gloves shall be available for hand protection against heat and flame, cold, chemicals, petroleum products, corrosive materials, moisture, mechanical abrasion, electricity, and sharp and rough surfaces.

10.2 Selection. Glove selection of the appropriate hand protection shall be based on an evaluation of the performance characteristic of the hand protection relative to the task(s) to be performed, chemical concentration and properties, physical conditions present, duration of use, and the hazards and potential hazards identified. The type of work gloves used must be approved by the regional health and safety director or designee as specified in the HASP for the particular task.

10.3 Electrical. When working on high voltage (480 volts and above) electrical equipment, electrically tested high voltage gloves will be worn. Leather protection will be worn over these gloves. (NOTE: Only authorized personnel are permitted to work on high voltage electrical equipment).

## 11.0 PROTECTIVE CLOTHING

OHM employees, subcontractors, and visitors will don appropriate protective clothing when engaged in any operation that presents a hazard to the body.

- 11.1 Use. Appropriate clothing shall be available for body protection against heat and flame, cold, chemicals, petroleum products, corrosive materials, moisture, mechanical abrasion, electricity, and sharp and rough surfaces.
- 11.2 Selection. Clothing selection of the appropriate body protection shall be based on an evaluation of the performance characteristic of the body protection relative to the task(s) to be performed, chemical concentration and properties, physical conditions present, duration of use, and the hazards and potential hazards identified. The type of protective clothing used must be approved by the regional health and safety director or designee and specified in the HASP for the particular task.

## 12.0 TOTALLY-ENCAPSULATING CHEMICAL PROTECTIVE SUITS

Totally-encapsulating chemical protective suits (Level A) shall be used in conditions where skin absorption of a hazardous substance may result in a substantial possibility of immediate death, immediate serious illness or injury, or impair the ability to escape.

- 12.1 Use. OHM will only use Level A protection when all other reasonable efforts of controlling employee exposure through engineering or administrative means are not possible.
- 12.2 Authorization. Level A protection may only be used after authorization of the regional health and safety director has been granted.
- 12.3 Health and Safety Personnel. An appropriately experienced health and safety employee must be assigned to the project site where Level A is to be used. They must evaluate that the following items are ready:
- Communications
  - Decontamination
  - Emergency rescue procedures and personnel
  - Emergency medical attention
- 12.4 Training. Site-specific training will be provided on donning use, doffing, decontamination, and emergency procedures for all employees required to use level A protective suits.

- 12.5 Decontamination and Disposal. OHM will discard and properly dispose of any Level A suit which has come in contact with chemical contaminants or sustained physical damage at least at the end of the project.

### **13.0 LOANING PERSONAL PROTECTIVE EQUIPMENT**

OHM personnel should not loan OHM personal protective equipment to any client, subcontractor, or visitor personnel. If there are urgent circumstances, such as an emergency response where the equipment cannot be obtained elsewhere and chemical exposure is possible, OHM personnel can loan personal protective equipment such as respirators, protective clothing and other safety equipment to client personnel or personnel from other organizations. However because of the potential liability involved, approval of senior OHM management is required as well as the requirement that a representative of the company and the individual using the equipment execute an OHM Indemnification and Release Agreement. A copy of this agreement is attached as Appendix A.

- 13.1 Execution of Indemnification and Release Agreement. In general, the following will be required BEFORE the personal protective equipment may be loaned:

- The OHM Regional Vice President (or designee) must specifically authorize the loaning of personal protective equipment on the particular project.
- An authorized representative of the company whose personnel will use the equipment must sign the Indemnification and Release Agreement.
- The individual who will use the equipment must also sign the Indemnification and Release Agreement attesting to the fact that the individual is either experienced in the use of the equipment or has been given instruction on the safe use of the equipment and is medically qualified to wear the equipment.
- An OHM representative must also sign the form as a witness to the above.

- 13.2 Contractual Requirement. An indemnification and release agreement is not required if providing personal protective equipment to clients or regulatory personnel is a contractual requirement.

- 13.3 Exemptions. Hard hats, safety glasses, hearing protection, and protective clothing provided for cleanliness is exempted for the indemnification requirement. Instruction should be provided to the individual prior to wearing.



**APPENDIX A  
OHM REMEDIATION SERVICES CORP.  
INDEMNIFICATION AND RELEASE AGREEMENT  
FOR PERSONAL PROTECTION CLOTHING**

FOR AND IN CONSIDERATION OF the use by the undersigned of property belonging to OHM Remediation Services Corp. (hereinafter referred to as "OHM") and which may include full-face mask respirators, self-contained breathing apparatus, and other equipment and supplies, and other good and valuable consideration, the undersigned, for himself and his successors, and assigns, does hereby release and discharge OHM, its officers, employees, agents, and subcontractors from any and all claims, actions, demands, damages, costs, loss of services, expenses, compensation, third-party actions, or suits, including attorneys fees, arising and resulting from the aforementioned use of property, equipment, or supplies belonging to OHM.

In addition, the undersigned, on behalf of his employer, principal, himself, and his successors, and assigns, agrees to release, save, and hold harmless, protect, indemnify, and defend OHM, and its officers, employees, agents, and subcontractors against any and all claims, actions, and expenses as above described, whether for bodily injury, property damage or destruction, or both, arising or resulting in any way from the use by the undersigned of property of OHM and agrees to save, hold harmless, protect, indemnify, and defend OHM against any such claims, actions, or expenses, referenced above, that might be brought against OHM by any third persons or the heirs, successors, executors or assigns of the undersigned.

The undersigned acknowledges by signing that he has carefully read this Agreement, understands the contents thereof, and has freely and voluntarily signed the same.

EXECUTED on \_\_\_\_\_, 19\_\_.

1. OHM Regional Vice President (or designee) authorizing use of equipment:

\_\_\_\_\_

2. CLIENT OR SUBCONTRACTOR REPRESENTATIVE AUTHORIZING EQUIPMENT USE:

I authorize the individual(s) in 3. below to use OHM provided personal protective equipment

Company Name \_\_\_\_\_

Sign Name \_\_\_\_\_

Print Name \_\_\_\_\_

Title \_\_\_\_\_

3. INDIVIDUAL USING EQUIPMENT: I certify that I am familiar with the equipment and medically qualified to wear the equipment

Company Name \_\_\_\_\_

Sign Name \_\_\_\_\_

Print Name \_\_\_\_\_

NOTE: A continuation sheet can be used if more than one individual is to be certified to use equipment

4. OHM Representative Acknowledging Signatures:

Sign Name \_\_\_\_\_



**OHM Remediation  
Services Corp.**  
A Subsidiary of OHM Corporation

**TABLE 1**  
**FACE PROTECTION SELECTION GUIDELINES**

Hazard	Protection
Flying fragments, objects, large chips, particles, sand, and dirt from chipping, grinding, work, riveting, and sanding	Safety spectacles or goggles Supplement with face machining, masonry shield for severe exposure
Chemical splash from corrosive and chemical handling, pressure washing operations	Chemical Splash Goggles Supplement with face shield for severe exposure
Nuisance dust from woodworking, buffing, and general dusty conditions	Safety spectacles or goggles
Hot sparks from grinding operations	Safety spectacles or goggles Supplement with face shield for severe exposure
Molten metal from torch cutting operations	Shaded cutting goggles (see Table 3) and face shield
Welding operations	Safety spectacles and shaded welding hood (see Tables 2)

**TABLE 2**  
**GUIDE FOR CUTTING SHADE NUMBERS**

<u>Operation</u>	<u>Plate Thickness</u>	<u>Minimum Protective Shade</u>
Gas Welding		
Light	Under 1/8	4 or 5
Medium	1/8 to 1/2	5 or 6
Heavy	over 1/2	6 or 8
Oxygen Cutting		
Light	Under 1	3 or 4
Medium	1 to 6	4 or 5
Heavy	Over 6	5 or 6

**TABLE 3**  
**GUIDE FOR WELDING SHADE NUMBERS**

<u>Operation</u>	<u>Electrode Size</u> <u>1/32 inch</u>	<u>Arc Current (A)</u>	<u>Minimum</u> <u>Protective</u> <u>Shade</u>	<u>Suggested*</u> <u>Shade No.</u> <u>(Comfort)</u>
Shielding metal arc welding	Less than 3	Less than 60	7	---
	3-5	60-160	8	10
	5-8	160-250	10	12
	More than 8	250-550	11	14
Gas metal arc welding and flux cored arc welding		Less than 60	7	---
		60-160	10	11
		160-250	10	12
		250-500	10	14
Air carbon Air cutting		150-500	10	14
	(Light)	Less than 500	10	12
	(Heavy)	500-1000	11	14
Plasma arc welding		Less than 20	6	6 to 8
		20-100	8	10
		100-400	10	12
		400-800	11	14
Plasma arc cutting	(Light)	Less than 300	8	9
	(Medium)	300-400	9	12
	(Heavy)	400-800	10	14
Torch brazing		---	---	3 or 4
Torch soldering		---	---	2
Carbon arc welding		---	---	14

\*As a rule of thumb, start with a shade that is too dark to see the weld zone. Then go to a lighter shade which gives sufficient view of the weld zone without going below the minimum. In oxyfuel gas welding or cutting where the torch produces a high yellow light, it is desirable to use a filter lens that absorbs the yellow or sodium line in the visible light of the (spectrum) operation.